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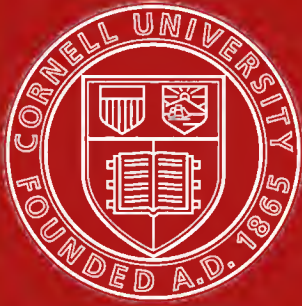


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OHIO STATE UNIVERSITY  
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NUMBER ONE

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THE  
THEORY AND PRACTICE  
OF  
**LETTERING**

DESIGNED FOR THE USE OF  
ENGINEERS AND DRAFTSMEN  
GENERALLY  
BUT ESPECIALLY FOR  
THE USE OF  
STUDENTS IN ENGINEERING

BY  
CHRISTOPHER E. SHERMAN, C. E.

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SIXTH EDITION  
NINTH THOUSAND

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MIDLAND PUBLISHING COMPANY  
COLUMBUS, OHIO

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1908

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## **PREFACE TO FIFTH EDITION.**

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The manuscript for the first edition of this manual was presented as a college thesis in June 1894, and published in January 1895. In addition to the changes noted in the second edition some lesser improvements were made in the third and fourth. The book is now largely rewritten, and enlarged by the addition of two plates and some historical and other notes, which it is hoped will lend more interest to the subject. Plates I and II have been redrawn by Mr. J. H. Vosskuehler of the department of architecture and drawing, Ohio State University, and plate X was designed and drawn by Prof. Thomas E. French of the same department. My thanks are due these gentlemen for a number of good suggestions. Plate IV has been redrawn, and thereby much improved, by Mr. T. B. Messick of Columbus, O., who also drew plate IX.

I hope that this brochure may continue to be of use to the engineering and drafting profession, and especially to that young engineer or student, who, like the writer, is not 'a natural draftsman.'

C. E. S.

August 18, 1902.

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## **PREFACE TO SECOND EDITION.**

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In the present edition Freehand lettering has received more attention and is made the subject of a separate chapter, which is in better accord with its importance. Three new whole page plates and eleven cuts are added. Also a few minor changes have been made in the text in various parts of the book.

It gives me pleasure, in this edition, to acknowledge my indebtedness to Professor J. N. Bradford of Ohio State University, for valuable suggestions offered in both the present and past editions.

November 6, 1897.

## PREFACE TO FIRST EDITION.

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The endeavor has been made in the present treatise: (1) To compile and place in order what has been written by others on Lettering, and at the same time to give the writer's own ideas upon the subject, treating those parts which had not previously been touched upon; (2) To reduce the art of lettering, as nearly as its nature permits, to a science; (3) To furnish an elementary practical treatise on the subject for students in engineering.

With these objects in view, the writer has availed himself of all the books he could find treating on the subject, and even had it been thoroughly covered in these books taken collectively, a work of compilation, merely, would have been of value, as the literature on lettering is so scattered; but besides being scattered, it is so scant and incomplete that the writer may claim almost entire originality for the present work, and in furnishing a complete treatise on Lettering he believes he will supply an urgent need. For a list of books examined in writing the present treatise see the latter pages of this work.

December, 1894.

## Chapter I.

# GENERAL PRINCIPLES.

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**1. Introductory Remarks**—Among the features that give effect to a drawing, not one is more prominent than the lettering. A map may be well drawn in every other respect and yet have its looks ruined by poor letters. The subject of Lettering, therefore, requires careful attention from the student, or engineer, who would attain even a small degree of proficiency in drafting. A large number of books and pamphlets on the subject have been published, but most of them, especially the earlier works, consist simply of collections of alphabets of various styles, giving little or no information as to how to form the letters, how to put them together to form words, what styles to use for certain purposes, when to letter, disposition of the letters, etc. The later books on the subject have usually taken up these matters, in addition to exhibiting different styles of alphabets.

The art of making neat and tasteful letters, such as the ordinary drafting operations of the engineer call for, is within the reach of any person who will take the pains to observe the details of good models closely, and have the patience to practice lettering until he has mastered those more important details. Ornamental lettering and titles, such as are made on maps intended for popular display, or which form the title pages to collections of drawings, may require some high order of talent; but these cases do not often concern the engineer, because in all drawings made for official or professional use, which will include by far the larger part of his work in drafting, the letters (even to the title) should be simple, neat, and dignified in appearance, and should be in accord with the general effect of the rest of the drawing. Every engineer should be able to represent, accurately and neatly on paper, any operations he may perform in the field, or any design he may make in the office. Such operations will require of the civil engineer, maps and profiles for municipal, county, and railway improvements, plans for structures including bridge drawings, topographic and hydrographic maps and charts, etc., etc.; of mechanical engineers, plans for power plants, drawings of machinery, patent office drawings, etc., etc.; of mining engineers, geological maps and charts, mine maps, and other drawings; and on all of these drawings simple letters, when well made, look best.

**2. Historical**—The origin of our alphabet is veiled in obscurity. Paleographers tell us that it probably originated in Egypt. Facts were there first expressed by pictorial representations, or hieroglyphics, much as our modern savage inscribed his messages on bark, or on the skins of animals. The Egyptian priests, in transcribing, abbreviated or simplified these hieroglyphs into the so-called hieratic writing, and from this writing the Phoenicians, sailors of the early seas, probably borrowed many of their characters.

From the Phoenicians the Greeks borrowed all or a large part of their letters.\* The Greek alphabet thus grew up on the coasts of Asia Minor, and by the middle of the 6th century B. C. had in all essential respects attained its final development; the letters had assumed the forms of the Greek capitals with which we are familiar. This alphabet was adopted as the alphabet of Athens in 403 B. C.

But from an early time the Greek alphabet shows a tendency to separate into two types—the Eastern or Ionian, which became the classical alphabet of Greece; and the Western or Chalcidian, which was the source of the alphabet of Italy. The chief differences between the two are those which still distinguish our own from the Greek alphabet. The primitive alphabet of Italy, from which our own is derived, belongs to the Western Greek type. As early probably as the 9th century B. C. it was carried by the Chalcidians of Euboea to Cumae, near Naples, which was a colony of Chalcis. It became the parent of five local Italic alphabets—the Oscan, the Etruscan, the Umbrian, the Faliscan, and the Latin. Owing to the political supremacy of Rome, the Latin ultimately displaced the other national scripts of Italy, and became the alphabet of the Roman empire, and afterwards of Latin Christendom, thus spreading over Western Europe, America, and Australia, and thus becoming the dominant alphabet of the world.

One hundred years before Christ the alphabet of Latin capitals, or roman as we now call it, consisted of twenty-one of our present twenty-six characters; but the twenty-one have remained so unchanged in form these twenty centuries that the child, which has but just learned its letters, could easily recognize them in Rome as they are carved on the triumphal arches which commemorate the glories of that departed empire. In the time of Cicero the Romans borrowed Y from the Greeks, and placed it at the end of the alphabet after X. Soon afterward Z was also borrowed from the Greek alphabet and placed after Y. It was introduced into the English alphabet from the French in the 15th century, being used in English, as in Latin, to spell words of foreign origin only. The letters U and V were practically interchangeable till about the 10th century, one form, V, answering for both up to that time. W is a Gothic addition. J is the youngest letter of the alphabet, having been differentiated from I at about the beginning of the 15th century. In the Old English, one form is still used for both letters (see plate III), and in the lower case alphabet the dot over the j still indicates its parentage.

It is difficult, at first, to see how the numerous styles of capitals to be seen in a modern type catalogue, all came from the original Roman characters. For example the alphabet on either side of the words Old English in plate III†,

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\*This theory has lately been brought into question by recent discoveries at Abydos in Upper Egypt. See paper read before the American Philological Association, July 9, 1901, by Prof. Wm. N. Bates.

†The style here referred to is called 'black-letter' by the printers of this country; in England the bibliographers call it Gothic, because it has always been the character preferred by all peoples of Gothic descent.



appears most unlike the roman, yet it is a degenerate form of the roman character and originated in this way. The scribes and calligraphists of the early centuries before printing variegated the roman letters into many queer book-hands, and in some cases beautiful papal and charter scripts. Angles were rounded and flourishes added, sometimes to conceal the inexpertness of the scribe, until in many instances the product could scarcely be identified with the original. The German scribes appear to have carried this matter of flourishes to the farthest limit; at any rate, at the time of the epoch-creating invention of printing their printers modeled their types after the fantastic letters then in vogue, and this distorted and illegible letter has remained the national book- and newspaper-letter of Germany until today. There are many styles of this black letter, of which that called Church Text, is an example. Black-letter was carried to England and was the prevailing book-type there so long, that the name Old English is often applied to it or some one of its styles.

The first printers naturally modeled their types after the best book hands and scripts they could find, and as the calligraphists had developed many styles by the middle of the 15th century, the infant art-craft started life with a full assortment of type-faces, and type-founders have been adding to the assortment from that day to this. (See any modern type catalogue.) Many styles of great use to the printer have been thus developed, and some of use to the technical draftsman. In this last class the most useful is that shown in plate II, a style called Gothic by the printers in this country, but often called sans-serif, or grotesque by English type-founders; it follows the form of roman letters, but all the hair-lines have been thickened to the size of stems. Other useful styles of faces, originated by type-founders, may be seen in plate VII.

Type-founders are not the only ones who have multiplied styles. The photo-engraving processes have furnished means for advertisers and for writers of books of alphabets to produce many other designs, some attractive and some otherwise, and many of the styles shown in plate III have been taken from these sources.

Fortunately for us, while the first German printers were reproducing the black-letter and other equally fantastic forms, the early Italian printers reproduced the simple early forms of roman. These types were brought to Paris in 1470, and fifty years later to England, where they gradually displaced the black-letter. The roman with its corresponding minuscule, has thus become the character preferred as a text-letter by all English-speaking peoples and all the Latin races. Its only serious rival in general literature is the fractur, or the popular face of German type; but even in Germany roman is largely used as the text-letter for scientific books, and for inscriptions on coins and medals. Not one of the many faces introduced by the type-founders of this century has ever been considered an improvement on, or accepted as a substitute for roman.\*

The modern face corresponding to the early roman lapidary characters, is that called Roman Old Style, which differs from the prevailing roman in having

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\*De Vinne: Plain Printing Types, page 185.

thicker hair lines. An example of this style is given in plate III on either side of the words Extended Alphabets. Objection has been raised to modern roman on the score of its weak hair lines, and modern reformers have attempted to change them. The most notable recent attempt in this line was that of William Morris, founder of the Kelmscott Press, but so far, his reform has not been generally accepted, for book work at least. Morris' reform pertained chiefly to the present roman small or lower-case alphabet.

The origin of these small roman letters is interesting. At the time of the early empire, the Romans employed two forms of their letters—capitals for inscriptions ; and for business and correspondence, degraded cursive forms, which are known to us chiefly from *graffiti* scribbled by schoolboys on the walls of Pompeian houses. These two roman scripts are respectively the sources of our printed capitals, and of our printed minuscules or small types. Out of the roman cursive, the Irish semi-uncial was developed as a book-hand about the 6th century A. D. Through Scotland it was introduced into Northumbria by Irish monks, and became the basis of the beautiful Caroline minuscule, so called because it arose in the reign of Charlemagne, in the calligraphic schools of Tours, founded by Alcuin of York. Owing to its intrinsic merits, consisting of its legibility and the ease with which it could be written, the Caroline minuscule rapidly became the book-hand of Europe ; but after the 12th century it began to degenerate into the black-letter, which was imitated in the types of the earliest printers, and is still retained in German books. The Roman printers, however, reverted to the better Caroline forms, which now go by the name of "roman" type.

The wide difference existing between our capitals and small letters is thus explained. We have, in fact, two alphabets, both dating from the first century A. D., in concurrent use. Thus the forms a b d r g m and h are derived from the old roman cursive, while A B D R G M H are the roman capitals. In d the loop of D has been transferred from the right to the left of the vertical stroke ; in g, two new loops have been formed, the little crook at the top being all that remains of the G ; in b the upper loop of B opened out and ultimately disappeared ; in r the loop and tail of R have undergone nearly complete atrophy ; etc. Seven of the lower-case roman letters are, however, simply smaller scale repetitions of the capitals. In the Russian alphabet of thirty-five letters all of the minuscules but three or four are small-scale copies of their corresponding capitals.

Arabic numerals were not introduced into Europe until after the 10th century A. D. Roman capital letters were used until about the 12th century by the nations of Western Europe to represent numbers, and the student can get some idea of the difficulties encountered by the early arithmetician by imagining himself deprived of the ten arabic figures and obliged to carry on his computations by letters. Thus, divide MDCCCXLIV by XCVIII.

The so-called Arabic figures, most writers agree, originated in India. From the latter, the Arabs received their system about the 8th century A. D. and largely developed it, and the Saracens afterwards introduced it into Europe. Unlike the old roman alphabet, the Arabic numerals have undergone so much

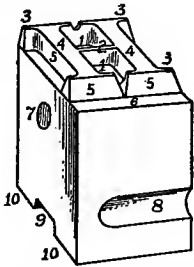
change that some forms made by the early printers cannot be deciphered by an unschooled reader, and the forms in use before the invention of printing are much more difficult still to understand. In Strange's Alphabets is given a series, of the ten figures, of the 12th, 13th, 14th, and 15th centuries, showing their changes in form up to the beginning of printing. The desirability of arranging figures in columns and tables has led to the adoption of a rather condensed shape; for example, the zero is not as wide as the letter O of the same height.

Plate I shows the roman form of Arabic figures. Plate II presents the Gothic style of the same figures. For a better account of the Arabic numerals see Prof. Robertson Smith's article on Numerals in *Encyclopaedia Britannica*.

The roman numerals I V X L C D M are not now used so extensively, except for numbering plates and prefatory pages in books, and for similar purposes.

The history of the alphabet and of lettering is most interesting. The most authoritative work on the subject is that of Dr. Isaac Taylor, *The Alphabet*, in two volumes, published in London in 1883. For a briefer and very interesting account of the development of lettering with many illustrative examples see *Strange's Alphabets*, published in London and New York in 1898. Since the invention of printing, the history of lettering is largely that of typography, and a most useful and instructive book on this part of the subject entitled, *The Practice of Typography—Plain Printing Types*, has been written by Mr. Theodore L. De Vinne. Published by the Century Co., New York, 1901.

**3. Technical Terms**—The following sketches illustrate some technical terms as applied to type by type-founders and printers:



- |                        |              |
|------------------------|--------------|
| 1. Counter.            | 6. Shoulder. |
| 2. Hair-Line.          | 7. Pin-Mark. |
| 3. Serif.              | 8. Nick.     |
| 4. Stem, or Body-Mark. | 9. Groove.   |
| 5. Neck, or Beard.     | 10. Feet.    |

Of the above terms, only those applying to the face of the type are used in lettering. Some terms used in lettering are as follows:

1. Stem, or body-mark; a stroke similar to the upright strokes in the letter H above. The straight ones are called simply straight stems, the others curved stems.
2. Counter; the space between stems.
3. Serif, or ceriph; a horizontal light line at the top and bottom of a stem, as in the above cut.
4. Hair-line; in the case of roman letters, a line joining two stems. The term hair-line, as used in printing, is very indefinite. In the Old Roman letters these "hair-lines" are quite thick.
5. Bracket; when the angle between a stem and serif is filled in or rounded off, the serif is said to be bracketed to the stem.

6. Spurs; we shall use this term to designate those portions of roman letters which resemble the right-hand part of the roman letter L.
7. Capital ; that form of letter with which a sentence begins.
8. Lower-case ; the ordinary text-letter of a book other than the capitals.
9. Majuscule ; the name applied to a capital letter in ancient Latin manuscripts.
10. Minuscule ; small or lower-case letters. A term usually applied to the small letters of old Latin manuscripts.
11. Uncial letters are those modified forms of capitals, one of which is illustrated in the following letter : **E** They first appeared about the 2nd century A. D. but did not come into general use until the 4th century.

The terms stem, serif, and hair line apply more particularly to roman letters.

Among printers letters are also classified as ascending, middle, and descending letters. The capitals of a given text are all ascending, and cap Q is both ascending and descending. Lower-case h is ascending, m is a middle letter, g is descending, and j is both ascending and descending.

4. **Forms of Letters**—The first thing the student of lettering has to master is the forms of the individual letters. Plates I and II present the styles of capitals for which the engineer will have the most use, and they give in detail the form of and the relative space occupied by each letter. The roman and Gothic capitals given in these plates may be easily shaded up in a variety of ways, so that when the beginner has mastered these two styles, together with the "Single Stroke Gothic", and the stump letters given in plate IV, or some other suitable small letter, he is well equipped for lettering engineering drawings. *There is no short cut in learning the forms of the various letters : it requires careful attention to and patient practice from good models.*

**Plate I** presents the upright roman capitals and roman form of Arabic numerals. This style of lettering has long been standard, and it is the fundamental form from which almost all others have been derived. It is used to a very great extent in various kinds of work, and when well drawn is not surpassed in neatness and beauty of form ; and it therefore demands careful study. The form of each letter can be better understood from a careful examination of the plate than from any perusal of a written description. However, attention should be called to some of the more important points.

To facilitate a comparison of forms, as well as to afford a simple means of drawing large letters mechanically, the space occupied by each letter has been divided into a number of little squares. The length of a side of one of these small squares is one-sixth of the height of the letter, and this unit—one-sixth of the height—is taken as the correct thickness of the straight stems. This represents average practice among draftsmen, although practice varies widely according to the style of letter employed. Among type-specimens one may find styles in which the thickness of the stem ranges all the way from one-half to one-sixteenth the height of the letter. One-sixth is usual, and will be adopted as the normal unit throughout this manual.

A B C D E

F G H I J K

L M N O P

Q R S T U

V W X Y Z

1 2 3 4 5

6 7 8 9 0 &





In addition to the small squares, circles have also been drawn upon some of the letters to better show their shapes. Also, instead of inking in the stems solidly as in ordinary print, they have been inked in outline only, for greater clearness. Letters drawn in this way, with only outlines shown, are said to be "open". The best way for the beginner to study the characters is to copy the plate, marking off the requisite number of squares and sketching in the letters as shown. By doing this he ought to learn, in connection with the shapes of the letters, the following points.

The widths of the letters vary considerably. By width is meant the dimension at the widest part, always excluding serifs.

I is	1	unit wide.	
J is	3 $\frac{1}{2}$	units wide.	
U and N are each	4 $\frac{1}{2}$	"	"
F, H, L, P and R are each	4 $\frac{1}{2}$	"	"
B, E and S are each	4 $\frac{1}{2}$	"	"
A, T, V, Y and Z are each	5	"	"
C, D, G and X are each	5 $\frac{1}{2}$	"	"
K, O and Q are each	5 $\frac{1}{2}$	"	"
M is	6	"	" or just square.
W is	7 $\frac{1}{2}$	"	"

Thus M is the only letter that is just square, (this is the origin of the printer's em, a unit for measuring composition); the W is nearly two units wider, but all the other letters are narrower. On letters less than half an inch in height, a variation of  $\frac{1}{4}$  of a unit in width will scarcely be noticed, so that on small letters F H L P R B E and S may all be of the same width.

The upper parts of the letters B E K S X and Z, it will be seen, are not so large as the lower parts. This fact, which has long been recognized in printing, depends upon a curious optical faculty which was known to the ancients. Take either the large or small letter s for example; if you turn a book upside down and look at the letters, every s will seem much smaller at the bottom than at the top, although when the book is properly held, both parts appear the same size to the eye. The fault of the eye is corrected in the type by making the upper parts of those letters, which cause optical illusion, smaller than the lower parts. For the same reason the upper parts of the figures 3 and 8 are made smaller than the lower parts. The horizontal hair line near the middle of the letters B E F H and R is nearer the top than the bottom of the letter, while in the letters A and P it is nearer the bottom. The curved parts of the letters C D G O and Q are arcs of ellipses, as shown by the broken circles drawn on each of the letters mentioned. Since the curved parts of these letters are so nearly arcs of circles, some draftsmen draw them with the compass, as they do also the curved parts of the same letters when drawn in Gothic style; if the letters are small the difference will hardly be perceptible, but it should be remembered that in standard letters these parts should be parts of ellipses. The curved parts of the letters E F L T and Z may be made with the compass if so desired,

although these parts are not necessarily arcs of circles. The letter **L** is made the same width at the bottom as the letters **E** and **F** are at the top. Two-fifths of a space up from the bottom and down from the top of each letter are drawn broken horizontal lines. These lines show where to begin to bracket the angles at the extremities of the letters. The matter of rounding off these corners, as shown, and of extending the little spurs to their proper length should be carefully observed by the draftsman, as they not only heighten the beauty of the letters, but they also give an impression of accuracy in the drawing. As a general rule, beginners make the ceriphs too short, and fill the angles too much. To properly draw the roman alphabet freehand is a severe test of the accuracy and carefulness of a draftsman.

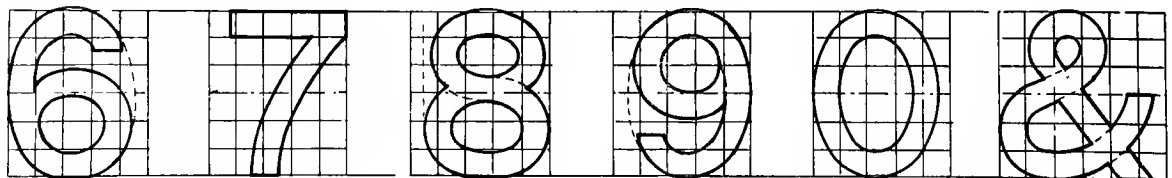
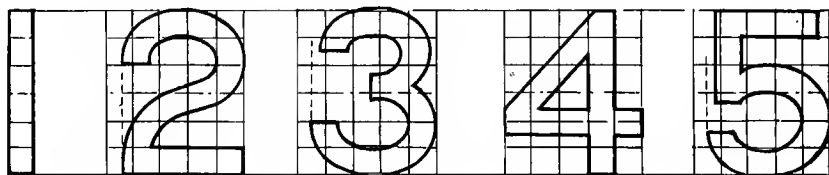
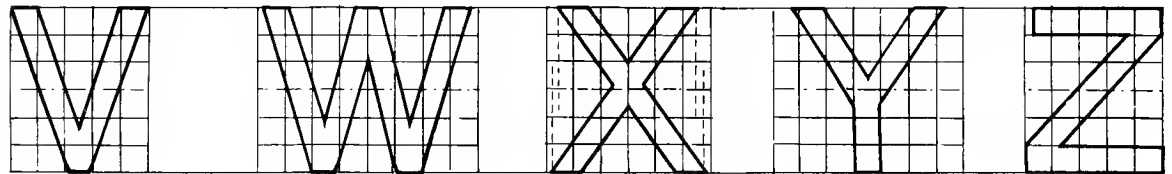
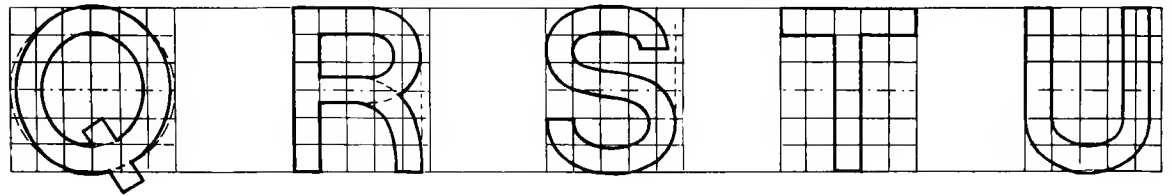
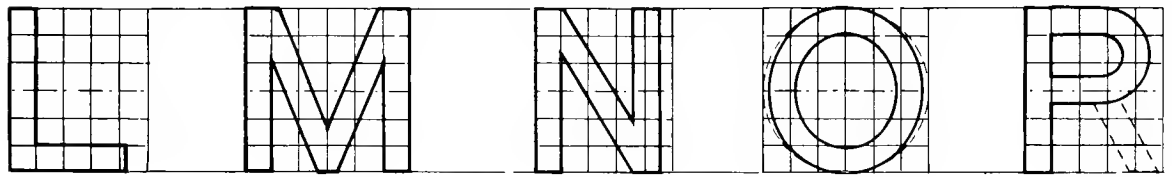
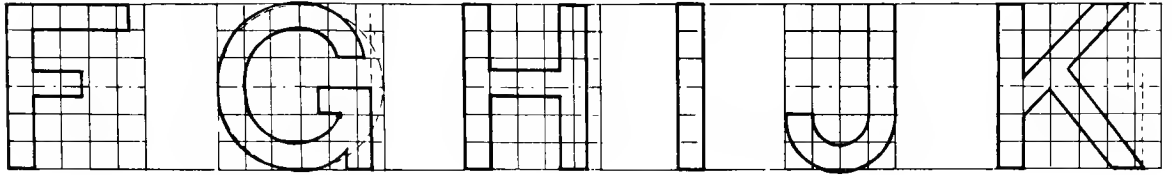
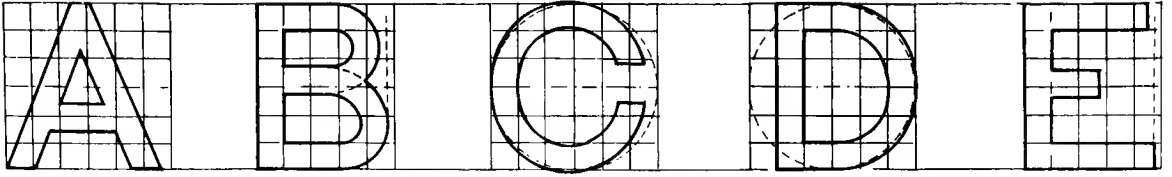
In the foregoing remarks some of the peculiarities of the roman letters have been pointed out. The student will note others by observing the plate carefully, and will perfect himself by practising on each letter. In making roman capitals when no alphabet is near for reference the beginner sometimes forgets which side of the letter to shade (make heavy). In such a case the following rule is well to remember. *All parts slanting from the upper left hand corner to the lower right are shaded, and all other inclined parts, with the exception of the letter Z, are not.*

**Plate II** presents the upright Gothic capital letters and figures. In this plate, as in plate I, the space occupied by each letter has been divided into squares, each square having its side equal to one-sixth the height of the letter. In this plate also, the letters have been inked in only in outline, in order to better show their form and construction. A complete Gothic alphabet inked in solidly is shown in plate IV. It will be seen that the main difference between roman and Gothic letters is, that the latter are of the same thickness in all their parts. The same rule which has been given for the stems of roman letters, gages the thickness of Gothic letters, that is, the thickness is generally about one-sixth the height of the letter.

Taking the dimensions at the widest parts, the widths of the Gothic letters are :

<b>I</b> is	1 unit wide.
<b>J</b> is	4 units wide.
<b>L</b> is	4½ " "
<b>F H N P</b> and <b>U</b> are	4½ " "
<b>B E R</b> and <b>S</b> are	4¾ " "
<b>D T V</b> and <b>Z</b> are	5 " "
<b>A C G K O Q X</b> and <b>Y</b> are	5½ " "
<b>M</b> is	6 " "
<b>W</b> is	7½ " "

By comparing this table with the table of widths of roman letters some slight differences will be noticed. The most important difference is the widening of the letters **A** and **U**. This change is necessary because of the effect of thickened stems on the counters. The other differences in width between





roman and Gothic forms of the same character are so small as to be neglected in small letters, say in letters half the size of those shown in the plate, or smaller.

Some of the remarks on the details of the roman capitals apply also to the Gothic. Thus the letters **B E K S X Z**, and the figures **3** and **8** are not so wide at the top as at the bottom. Also the curved parts of the letters **C D G O** and **Q** are arcs of ellipses, as shown by the circles dotted on them; in some styles of Gothic type the curved parts of these letters are made circular, but it is better form to make them arcs of ellipses, as shown.

The student can master the Gothic alphabet, given in plate II, in the same way he has learned to make the roman letters. Gothic letters being of the same thickness throughout and not having serifs, nor so many curved parts as the roman letters, are much more easily and quickly made, and for this reason are much used by the engineer. Gothic letters can be made "open," as in the plate we are now considering, or the outline may be filled in solidly, as in ordinary type, or be shaded up in a variety of ways as shown in plate III, so that it is a style of letter which may be used to advantage on a variety of drawings.

An especially useful letter is the Gothic alphabet shaded as shown in the second line of letters from the bottom in plate IV. To make this style, each letter is first drawn entire in pencil, then those sides of the letters are inked, which would be in shade if the light were considered as coming from the upper left hand corner down at an angle of forty-five degrees across the letter; if desired the light may be considered as coming from the upper right hand corner down towards the lower left, and the letters shaded accordingly. *Care must be taken to do the shading accurately and consistently, and especially is this true of the curved letters* if neat results are desired. Letters formed in this way can be easily made to look neat and can be quickly drawn, two great advantages.

**5. Mechanical Methods of Lettering**—By the method of laying off squares, as illustrated in plates I and II, having regard also to the succeeding articles on spacing, sizing, and disposition of the letters, the beginner will be able to letter any drawing he may choose. In this way any suitable letters may be sketched on the drawing in pencil and then inked in with the right-line pen, using irregular curves or bow pen for the curved parts of the letters; the pencil construction lines are, of course, erased after inking. One writer has adopted this system for every alphabet in his book, with the additional simplification of replacing all curves by straight lines; but the resulting letters appear too stiff and mechanical to be very pleasing.

A second method is to procure from some type foundry a catalogue having a large assortment of letters, and by means of a tracing, transfer from the catalogue any desired letters to the drawing. (A series of alphabets printed on slips especially for this purpose may be purchased of the Queen Supply Company of Syracuse, New York, for 50 cents.) Another way still, is to procure stencils of letters of desired sizes and styles from some dealer and use them with the aid of the suggestions on spacing, sizing, etc., already mentioned; but the objection to

this method, as also to the preceding one, is that it requires such a large number of letter stamps or copies, to fit the various cases of lettering that occur, that time is lost in selecting the proper letters from so many.

To save the time which good pen lettering requires, an instrument has been devised by J. A. Ockerson, C. E. The device is described as follows: For letters a stamp is used. The type composing any desired name is set up and clamped in a type holder at the base of the piston, and after inking, is impressed upon the paper through an opening in the base of the frame. The outer edges of this base being rectangular, with two of them parallel to the line of type, serve as guides in locating names. For numbers, three concentric revolving discs are used, each disc containing the ten numerals in type, so that any combination of three figures is readily formed. Ockerson's device is being used to some extent by the United States engineers, and it is claimed to be quite economical and efficient in offices where lettering is done on an extensive scale. On smaller works the device has not as yet come into general use, and it is probable that it would not be so economical in smaller offices. The device is sold by the A. S. Aloe Company, St. Louis, Mo., and any one wanting a fuller description can procure a descriptive pamphlet from them

Lettering triangles, made of transparent celluloid or hard rubber, are also used to some extent. These instruments are used in connection with a T square and are similar to the ordinary triangle in having two edges perpendicular to each other, but the hypotenuse is replaced by a number of edges at various slopes corresponding to that of the stems of the letters having inclined parts. With the simplest form of this instrument, the T square must be shifted for each letter of different slope. In a later form this inconvenience is avoided. The most useful form of lettering triangle is that devised by Professor Jacoby and made by Theo. Alteneder, Philadelphia. In this triangle the edges adjacent the right angle are 3 and 8 respectively, the hypotenuse thus giving the proper slope for inclined or italic letters.

No mechanical device can take the place of the ability to letter drawings freehand neatly and quickly. For treatment of this subject see next chapter.

6. **The Spacing of Letters**—*The spacing of letters is fully as important as their correct formation.* Each letter may be perfectly shaped, and yet if the letters are not properly spaced the finished word will look awkward. It will be seen from plates I and II that letters vary considerably in their width, the **I** being the narrowest and the **W** the widest: "If, therefore, the letters composing a word be spaced off at equal distances from center to center, the interval or space between the letters will be more in some cases than in others. Thus in the word

RAILWAY

To avoid this, write in first one letter and then space off a proper interval,



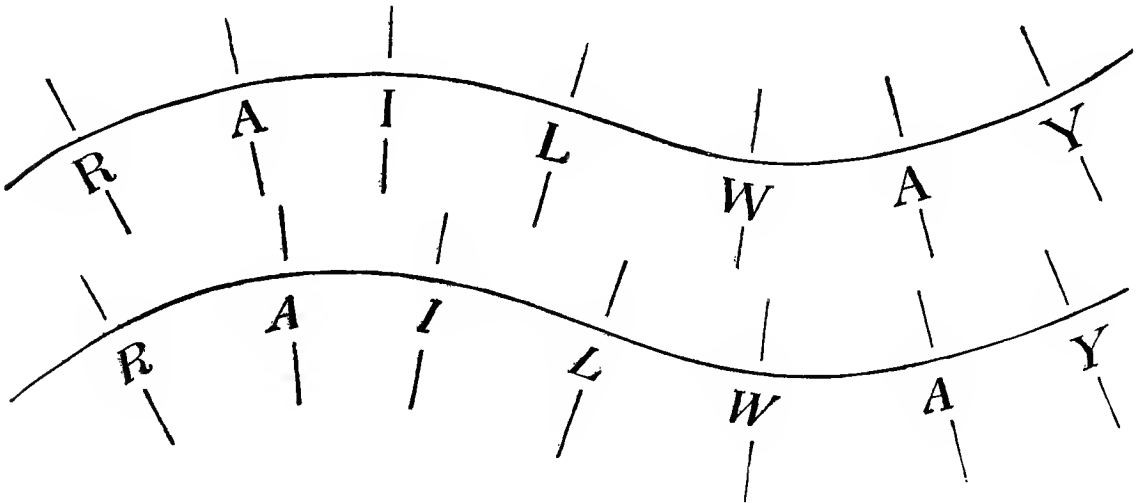
and then write in the next letter and space off the interval as before, and so on, thus:

RAILWAY

When, as frequently happens, the words are very much extended in order to embrace and explain a large extent of surface or boundary, and the space occupied by the letter is small in comparison with the interval, the disparity of intervals will not be noticed, and the letters may then be laid off at equal spaces from center to center, thus :

R A I L W A Y

When the lines of letters are curved the same rules for spacing are to be observed as above. If the letters are upright the sides of each letter are to be parallel to the radius drawn to the center of the letter, and the bottom and top lines at right angles to it. If the letters be inclined, as *Italic* letters, then the side lines of the letters must be inclined to the central radial line, as on a horizontal line they are inclined to the perpendicular, thus:”\*



However, upon closer examination, we find that the method of spacing first explained above does not completely remedy the difficulty. For plainer explanation let us take the word “Waverly.” From plate II we can find the proper width for each letter, and we will accordingly write in the letters, allowing between

\*Appleton’s Cyclopedia of Drawing.

each one an interval equal to two-fifths the height of the letter, (the usual interval), thus :

W A V E R L Y

It will be seen that notwithstanding the\*fact that we have not spaced the letters off at equal distances from center to center, but have given each letter its proper width with the same interval between each one, the word, as a whole, looks awkward to the eye. The fault is that the letters **L** and **Y** appear to be quite too far apart, and the letters **W A** and **V** slightly too much so, to agree with the spacing of the other letters.

This defect can be remedied by making the intervals between the letters mentioned smaller than those between the other letters, thus making the intervals irregular as well as the widths of the letters, as follows :

W A V E R L Y

Here it will be seen that while **E R** and **L** are a full interval apart, the distance between the spaces marked off for **W A** and **V** is less than a full interval, while there is little or no interval between the spaces marked off for **L** and **Y**. Upon the same principle we have made the interval between the spaces marked off for **V** and **E** slightly less than a full interval. Thus we may gather the following : when the letters **L** and **T**, **L** and **Y**, **T** and **A**, **L** and **V**, **T** and **J**, **F** and **J**, etc., come together in the order indicated, they should be spaced considerably closer together, and when letters occur in words thus, **VA**, **AV**, **LO**, **FO**, **TO**, **WA** or similar combinations, they should be spaced slightly closer together, in order that the finished word will not appear to be irregularly lettered, but will look correct to the eye. There should not be a preponderance of black nor of white, and to gain this end the white areas between the letters should be approximately equal in amount. The idea in spacing letters properly, thus, is the same as in making map work neat generally, the letters should be so spaced as to impart the desired impression clearly and quickly and give a pleasing general effect.

The interval between words, ordinarily, is equal in width to the height of the letters on the line. But this matter depends so much on circumstances that there is no regular rule to be followed.

The details which have been pointed out above may seem trivial, but it is exactly attention to these little matters that makes the skillful draftsman, and if they are carefully studied and practiced at first, it will afterwards become second nature for him to observe them.

7. **Size of Letters**—The size of letters, relative to the drawing on which

they are to appear, is an important point and will depend upon two things ; the scale of the drawing, and the importance of the object described. The largest letters are generally used in the title for the name of the object or tract represented, the smallest for explanatory notes usually ; and between these dimensions, the sizes are proportioned to the importance of the different features represented. Numerous suggestions have been offered in defining the heights of the letters to be used, but it is hard to frame a rule that shall fit all cases. The following proportions have been suggested by Prof. Charles McMillan :

Scale.	Height of largest upright capitals.	Height of small letters for explanatory notes.
$\frac{1}{600}$ or 1 inch=50 feet.	$\frac{6}{10}$ inch.	$\frac{12}{100}$ inch.
$\frac{1}{2640}$ or 2 feet=1 mile.	$\frac{5}{10}$ inch.	$\frac{10}{100}$ inch.
$\frac{1}{5280}$ or 1 foot=1 mile.	$\frac{4}{10}$ inch.	$\frac{8}{100}$ inch.
$\frac{1}{10560}$ or 6 inches=1 mile.	$\frac{3}{10}$ inch.	$\frac{6}{100}$ inch.

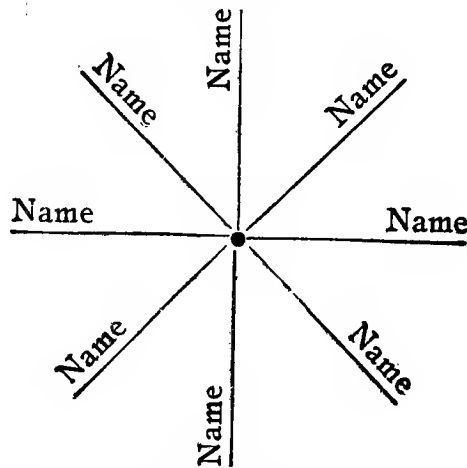
Select a map for illustration. Since a pond in one map may rank in importance with an ocean in another, it is evidently impossible to prescribe exact sizes of letters for the different features. The following has been suggested by another writer : “As a rule no letter should exceed in height  $\frac{3}{100}$  of the length of the shorter border of the drawing on which it appears.” This may be followed as a general guide in limiting the size of the largest letters to be used, while the propriety of relative importance, should, of course, be everywhere observed, as for example, on a map a city demands larger letters than a town, a river needs larger letters than a creek, and a county would require larger letters than a township. The above rule, together with an examination of the drawing in hand and observation of other drawings, will serve to give the beginner a fair idea of the proper gradation. It is the rule for beginners to make the letters too large for the drawing, and they seldom get the lettering proportionately too small.

**8. Disposition of the Letters**—Names should be so placed on drawings as to be easily read, show clearly the object designated, and not obscure the other features of the drawing. After the careful consideration of this rule the draftsman should next bear in mind that names should be so placed as not to appear crowded, and thus mar the general effect. The following rules taken from “Reed’s Topographical Drawing and Sketching” are well chosen, and apply to drawings in general, as well as to maps in particular.

For isolated features, the names are placed, when possible, at the right or left of, and close to the different objects designated and parallel to the lower edge of the border, the space between the letters and words conforming to those of ordinary print.

For communications, the names are placed parallel and close to the edges or boundaries ; the spaces between letters remaining the same as in ordinary print, while the words are separated by intervals, which for uniformity in the same map, may be taken equal to the largest word there used for these designations. The bases of the letters are best turned toward the communication, and such part of the latter should be selected for the name that when the drawing is held in its proper position the letters will not be reversed: e. g. if the road extends upwards to the right or downward to the left, or in a vertical direction, the name is placed on the left of it ; if horizontally, above ; otherwise to the right.

For streams the same rules apply as for communications, except when their widths are at least twice the height of the letters, in which case the names are placed along the axis of the streams, independently of the direction of the current which is indicated by an arrow. The accompanying figure shows the proper positions of names relative to lines of features having various directions :



For elongated outlines, as in the case of forests, marshes and bodies of water, the names are extended in the direction of greatest dimension and along straight or smoothly curved lines midway between the boundaries. The letters are not "extended," but, with the words, are so spaced that the name in each case will occupy nearly the entire length of the feature, the spaces being proportional to those used in ordinary print. In certain cases, when names placed on the features would obscure them, or the scale of the map is very small, a legend, or list of the names is placed in an unimportant part of the map, or outside the border ; and corresponding letters or numerals attached to the different names and features serve as mutual references. These names should be horizontal, and arranged in one or more vertical rows.

**When to Letter**—The entire drawing, even to the lettering, should first be made in pencil, if the draftsman would be sure of his work. Disregard of this rule many times spoils a drawing and often wastes time in the end. Generally in a pen drawing, with the exception of the title, the letters should be inked in first, as the characteristic lines of the other features will usually be more easily followed if they should be broken, than would the lines of the letters. Ofcourse

the letters should be so placed that, observing the rules already given for disposition, they will not fall on places which other features must occupy; but this is often unavoidable, and in such a case the feature that is more easily followed is the one to be broken.

In some special cases the letters can be made large and open and the features inked directly upon them; but it is better to break the lines enough to place each letter, if this will cause no mistake in interpreting the drawing.

If the drawing is to be tinted, the letters should be inked in last, having been so executed previously in pencil that no erasing will be required after inking; the tint would be partially removed by erasing the pencil lines that have been washed over, and, if the letters are inked before the color is laid the ink will very likely blur upon being washed over, even though it may be advertised as "waterproof".

The usual order of procedure, then, in a pen and ink drawing, is to make the entire drawing in pencil, letter it and draw the title in pencil next (and if this precaution is taken it matters not whether the lines or letters are inked first), ink in lines and letters of the body of the drawing, and ink the title last.

10. **Style of Letter to be Used**—The style of letter to be used depends upon the character of the drawing and upon the permanent general interest of the work, and, generally more than one style is used to designate the different features of the same drawing. Usually it will be found advantageous to use several styles to describe the various features, but it is not advisable to use too many styles on the same drawing, where many of the different features can be distinguished easily by differently *sized* letters of the same style.

The following rule is to be observed: *the letters used should agree with the character of the drawing*; they should be in accord with the general effect of the drawing on which they are placed. Thus, while a complicated and highly finished drawing may receive letters of a more ornamental character, plain and simple letters look better on a plain drawing. We would not use rustic or vaguely formed letters on a geometrical drawing. In such an instance one of the geometric styles, say Block letters, or the Geometrical letters just below the Old English alphabet in the center of plate III, would be more appropriate.

In any case, no hand-writing should be allowed on a finished drawing.

In plate III a variety of styles is given, partly to show some that are appropriate for technical drawing, partly to indicate what styles not to use, and partly to illustrate some miscellaneous features in lettering. The writer first learned lettering from a book of "alphabets for the use of architects, engravers, engineers, artists, sign-painters, etc.," without any word as to which was the engravers' letter, which the sign-painters', and which the engineers', and the result was even more confusing to the novice than the present plate would be without an explanation. From the above source the styles indicated as Pearl, Old English, and Velvet were taken. These letters, or similar styles, may be

seen on many old drawings, but at present are out of date, as practice now tends to much simplicity in technical work.

For mechanical drawing the simplest styles are used. Gothic, Geometrical, Block, or Half-block are those most frequently used, but plain Gothic is used more than any other. For sub-titles and details the "Single Stroke Gothic", (called also "Hairline Gothic"), is an excellent letter. For explanatory notes stump letters capitalized with inclined roman are good; also, the letter known as the "Engineering News Style", capitalized with inclined Hairline Gothic, is excellent for explanatory notes, and the lettering of other small details. For title-letters to mechanical drawings in addition to the above styles, plain upright roman, and plain Gothic with a shade line around each letter as shown at the bottom of plate V, may well be used. If the drawing were very bold and black, the Half-block shaded as in the words United States in plate III might be suitable for important title-words.

Roman is the standard style for topographic maps and charts, if drawn in ink. Upright roman is used for titles, and for the names of the more important political divisions, as states, counties, townships, cities, etc. Water features are always designated by inclined letters; for this either roman or Gothic may be used, Gothic being used for the smaller and less important bodies of water, as ponds or creeks, depending on the scale of the map. Stump letters are also used for unimportant stream names, and other minor features. Inclined Hairline Gothic is often used for communications, as roads and railroads.

Topographic drawings in water color require a light form of letter. Open roman is most frequently used but is somewhat disappointing. For important title-letters the open Finished Roman near the top of plate III, answers well. Open Gothic may also be used, and where large letters must be used to cover a wide expanse of symbols in color, the "Gothic Shade-line" letter, shown second line from the bottom of plate IV, is very good. As in pen-topographic drawings, inclined letters are used to denote water features.

For street names in large scale city plats, plats of additions and subdivisions, the Gothic shade-line letter just mentioned is good because rapidly made, and because the body of such a drawing is usually light and requires a light form of letter. The "Shaded Roman" near the bottom of plate III is a good title-letter on drawings of municipal improvements.

For working drawings of engineering structures, Gothic shade-line, or Gothic variously shaded may be used in the title, and single-stroke Gothic, and stump letters for details, bills of material, and explanatory notes. Inclined roman is used as a capital letter for these stump letters, and the latter should be three-fifths as high and thick as the accompanying capitals. As the plans become more important and of more permanent interest the lettering may be done in upright roman characters if appropriate to the body of the drawing.

For more elaborate drawings, still, such as plans for public buildings, architectural designs, etc., the lettering may appropriately become more artistic.



# GOTHIC LETTERS SHADED UNITED VARIOUSLY STATES

ROMAN FINISHED ROMAN  
OLD EXTENDED B Q Z G  
STYLE ALPHABETS K P V X  
C F H W

A B C D E F G H I J K L M

PEARL  
Round ITALIAN PRINT Writing

3 A B C D E F G H I J K L M N 3

O P Q R S T U V W X Y Z

A O P Q R S T U V W X Y Z N

B O F H J K N P Q - GEOMETRICAL - S U V W X Y Z &  
GEOMETRIC ITALIC V X Y Z INCLINED GOTHIC

N O P Q R S T U V W X Y Z

LITERARY QUAIN ROMAN MEDAL, PROGRESS  
QUAIN OPEN NUGGETS MELANGE

HELPFUL HINTS OUR MEDICAL MUSE

THE FACTOTUM CLINICAL CLIPPINGS

EMPIR SHADED ROMAN UNDRY

F G H I J K L M VARIOUSLY N P Q R S

X SHADED BLOCK LETTERS Z



Roman Old Style may be used in the title, and for sub-titles Quaint Open, Quaint Roman, or some of the styles shown in the lower portion of the plate of type-specimens, always being careful to see that the style chosen harmonizes with the general appearance of the rest of the drawing. In the next chapter some additional architectural styles are given.

Other useful title-letters are Italian Print, (which should be used sparingly, however), and roman shaded as in the words Shaded Roman near the bottom of plate III. On either side of these words are the letters E M P I R etc. which are too ornamental for ordinary work, but which might be used sparingly in titles on a map that is to be engraved and on which, consequently, some time might be spent in finishing.

If a Gothic or roman letter inked in solidly would be too black to harmonize with the rest of the drawing, either style may be drawn in outline only and filled with "shading" of suitable blackness. The Gothic alphabet, especially, lends itself to this treatment, but the student should be careful not to choose bizarre designs of filling as illustrated in the words Shaded and Letters in the bottom line of plate III. The shading of Gothic and roman letters is further illustrated in the first and last titles in the first plate given in the chapter on titles, and these two examples indicate approximately the maximum amount of shading consistent with good taste.

Owing to the haste with which drawings sometimes have to be made and the time consumed in making ordinary letters, a style of lettering called Round Writing, also called German Round Hand, has for some time been in use. An example of this style is given in plate III; it has been used to quite an extent by engineers, especially on working drawings. The objection to it is, in kind, similar to that urged against hand-writing, that is, it does not so easily give a clear and concise impression as do the older and standard styles of letters; it can not always be read at a glance. This objection is not nearly so marked, of course, in Round Writing as in hand-writing. However, as lettering by this means is so rapidly done, Round Writing will probably always be used to quite an extent, especially in working drawings. The method was devised by Frederick Soenneken, and was used in Germany before being introduced in this country. The characters are all made by single strokes of the pen, an especial pen and pen-holder having been devised by the inventor for the purpose. The student who wishes to inquire further into the subject can procure copy book, pens and holder from Keuffel and Esser, New York and Chicago. The copy book contains instructions for learning the method.

The words Extended and Alphabets, near the upper part of the plate, show how the proportions of letters may be changed to make words fill an elongated or compressed space. Any style may be similarly treated, and when modified as in the first word mentioned are said to be extended; when treated as in the word Alphabets the letters are said to be condensed or compressed. Condensed letters are extensively used in newspapers for headlines.

In the various words near the bottom of the plate, below the Velvet letters N to Z and above the words Shaded Roman, is illustrated the effect of different shading and filling, together with modified forms. These words selected from advertisements, etc., also illustrate the value of correct spacing. Take the word Melange for example; the individual letters are oddly shaped, yet the spacing is true and the word, as a whole, is not displeasing to the eye. According to what has been previously said, few, if any, of these styles would be used on strictly technical drawings; they are given here to illustrate shading, spacing, and the devices sometimes employed to overcome the difficulties of spacing; see the words Medical, Factotum, etc.

In the foregoing paragraphs we have given suggestions on selecting suitable styles for various work, but this subject is more a matter of experience and observation, than a question to be settled by rules.

If the student wishes more elaborate styles, he can become acquainted with them by observing artistic street signs, lithographs, and the like, or by consulting type-founders' catalogs, from which many books on lettering are derived; but if he expects to devote himself to engineering drafting only, it will be better for him to master thoroughly a few simple styles, than to attempt the more difficult ones.

For additional remarks on freehand styles see next chapter.



## FREEHAND LETTERS

## UPRIGHT ROMAN CAPITALS

A B C D E F G H I J K L M N O  
 P Q R S T U V W X Y Z &  
 1 2 3 4 5 6 7 8 9 0

## INCLINED ROMAN CAPITALS

*A B C D E F G H I J K L M N*  
*O P Q R S T U V W X Y Z*

## UPRIGHT ROMAN SMALL

abcdefghijklmnopqrstuvwxyz

## SINGLE STROKE GOTHIC

ABCDEFGHIJKLMNOPQRSTUVWXYZ

## INCLINED SINGLE STROKE GOTHIC

*ABCDEFGHIJKLMNOPQRSTUVWXYZ*

## STUMP LETTERS

*abcdefghijklmnopqrstuvwxyz*

## UPRIGHT GOTHIC SMALL

abcdefghijklmnopqrstuvwxyz

## INCLINED GOTHIC CAPITALS

***A B C D E F G H I J K L***  
***M N O P Q R S T U V W X Y Z***

## UPRIGHT GOTHIC CAPITALS

**1 2 3 4 5 6 7 8 9 0**  
**A B C D E F G H I J K L M**  
**N O P Q R S T U V W X Y Z &**

## Chapter II.

# FREEHAND LETTERING.

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11. After the student has become familiar with the forms of each letter, and has learned to letter by dividing up the space for each one into squares and using the ruling-pen and irregular curves as explained in preceding articles, he should then learn to make the letters freehand, simply using two pencil lines for guides. While the mechanical methods previously explained may be resorted to in making large letters on elaborate maps, or on drawings which are to be kept as permanent records, and on which the draftsman will have time to make the letters exact, yet in most drawings this is too slow a method, and he should be able to make letters freehand neatly and quickly.

Accordingly, in plate IV are given seven alphabets which the student should learn to make freehand. The upright roman and Gothic small alphabets, given in the plate, have been put in more for completeness than for any great use which is made of them by the engineer ; they need not be mastered, as they are so little used in drafting. The upright roman small letters are used in the published maps of the U. S. Coast and Geodetic Survey, and the U. S. Geological Survey, but, outside of this, they and the Gothic small letters are little used in engineering drawings, for the reason that it takes so much time to make them satisfactorily. The Gothic lower case is perhaps the most difficult of all to make look neat. Stump letters are employed almost universally in drafting in place of the upright or inclined roman small letters. These stump letters should slant at the same slope taken for inclined capitals, that is, a slope of three to eight.

The upright and inclined roman capitals, the single stroke upright and inclined Gothic, the stump letters, and the upright and inclined Gothic capitals, which are given in the plate, are used almost daily by the draftsman, and when the student has learned to make these letters freehand neatly and quickly he is well equipped for lettering engineering drawings. Even though the student may not succeed in thoroughly mastering these styles with regard to the forms of the individual letters, still with the proper spacing and sizing the effect is superior, as has been previously stated, to lettering in which each letter is perfectly formed, but in which the spacing or sizing has been improperly done. Therefore, let the student master as nearly as he can the freehand styles here given and not become discouraged if he does not become expert.

In freehand lettering, at least top and bottom pencil guide lines should always be drawn first, and then the letters drawn in pencil before being inked in. Possible exceptions to this are single stroke freehand letters, where the only pencil lines necessary in some cases are the guide lines ; but very often

with these letters it will be desirable to draw them in pencil first, to be sure of the spacing. *The student*, before entering upon the following instructions, *is supposed to know the relative width of every letter of the alphabet*, having learned them from plates I and II, or from the tabulated widths on pages 7 and 8, as given in the preceding chapter.

**12. Preliminary to Arts. 13 and 14**—Before taking up freehand lettering the student is supposed to have had training enough in drawing to make him proficient in such exercises as connecting two parallel lines by freehand normals, bisecting short distances by eye, placing dots on one line directly underneath those on another, etc., etc.; if not, he should practice these simple exercises until he can do them rapidly and accurately freehand, checking himself with triangle and tee-square. The ability to draw freehand quickly a short straight normal, as *kl* perpendicular to *km* in Figure A, and to bisect short distances by eye, as *km* by a dot at *w*, is very useful if not essential to skill in rapid freehand lettering.

The student should note carefully the following injunctions before beginning on the roman and Gothic letters of the next two articles :

- (a) *These instructions relate to drawing the letters in pencil.*
- (b) *Use a six or seven H lead-pencil.*
- (c) *Always keep it sharpened to a slender cone-point.* You can not do good lettering with a blunt pencil.
- (d) *Remember that stems are  $\frac{1}{2}$  the height of the letter in thickness.*
- (e) *Remember that serifs are one unit long.* This applies to the sizes usually drawn freehand, and comprises all roman letters half an inch or less in height. For larger letters than those shown in the following cuts the correct length of serifs is as given in plate I.
- (f) *Always rule top and bottom guide-lines.* If the letters are large a third may be ruled midway.
- (g) *Rule guide-lines with straight-edge, draw width-lines freehand.* The latter lines may be drawn with triangle but this will usually take more time and cause more trouble with the spacing. A given letter is always finished (or nearly so) in pencil before the width-lines for the next succeeding one are drawn.
- (h) *Always use limiting verticals, or "width-lines" as we shall call them, in connection with guide-lines,* as illustrated in sketch below, where *de* and *hi* are the width-lines for A. The distance apart of these limiting verticals, in units of  $\frac{1}{2}$  the height, is given for each letter on pages 7 and 8, and is the width at widest part excluding serifs.
- (i) *Always use a square as explained below in drawing these width-lines.* The dot and dash lines represent the squares, the broken lines denote the width-lines, in the figures following



The use of square and width-lines is illustrated in the accompanying cut, and the advantage of using them may be shown in drawing the roman capital A. Let the student first draw freehand, without side guide lines, the two outside lines of the letter as at 1 of the figure. He will find it difficult thus to get both lines at the same slant and the letter of correct width. Next let him proceed as at 2: here the width-line *de* was first drawn, then *fg* so as to make *defg* square, then one unit (or a stem) cut off the right hand side leaving *dehi* to contain the letter; by eye bisect *dh* by a dot at *w* and join *we* and *wi*. By the second method both uniformity of slope and correct width are easily secured, if the student can readily estimate a square.

A square can usually be readily and correctly drawn by any person who can draw a short normal as *de* fairly well, since the two guide lines aid very materially in quickly placing freehand the fourth side very close to its proper place, at least within a quarter of a unit, and this error will seldom be noticed in ordinary letters.

If the beginner should attempt to mark out the rectangle for a letter without the use of the square the result is usually that the narrow letters are made too wide and the wide ones too narrow. Let the student draw some letter, as J or W, by this method.

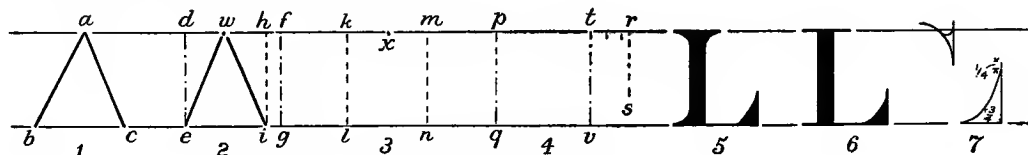


Figure A

In making each letter, then, the square should first be used, and the necessary space cut off or added according to width of letter. Thus for N cut off  $1\frac{1}{2}$  stems; for W add  $1\frac{1}{2}$  stems and obtain the proper rectangle, as *p q r s* at 4 of the above figure. After drawing the left-hand width-line, the work may be abbreviated by simply placing a dot on the top guide line at a distance marking off a square, instead of drawing a full line there. The amount cut off or added may be as easily measured from this dot as from a line.

Each letter is finished in pencil before the width-lines for the next are drawn. This rule is to aid in spacing correctly. After the letters are penciled in they may be inked freehand or with the use of right-line pen, according to size of letters and skill of the draftsman.

*If the student has carefully noted the above instructions, the remaining directions are very simple, and the method of forming each letter is sufficiently indicated by the arrows in the following figures. However, a few remarks, which may be helpful, will be made in connection with the letters as we pass them by.*

**13. Upright Roman Capitals**—A few remarks applying especially to these capitals first. In the following cuts the serifs are usually omitted, with the understanding that they are the last strokes made in each letter. They

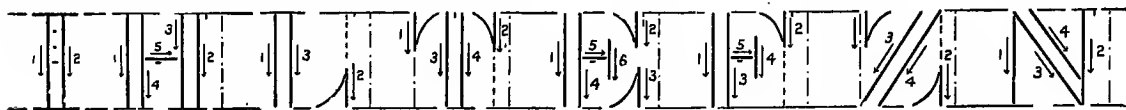
should be carefully extended to their proper length before rounding off the corner between stem and serif, *and remember* that in letters half an inch in height or less, *these corners need little or no bracketing*. This is illustrated in the two L's on the preceding page. The second L shows that it is better not to use bracketing at all, than to fill the angle too much—a common fault with beginners.

All spurs (portions similar to the right hand part of L) should be made carefully. If they are drawn as in the first L, the letter will appear too stiff. If the angle is not filled enough, the letter will have a 'starved' appearance, especially if accompanied by fat stems. The spur should end in a hairline at either extremity. A spur on an enlarged scale, is shown at 7 of Figure A.

The roman letters have more optical illusions than perhaps any other style. These are to be humored but must not be exaggerated. Thus in plate I the letters are large and eccentricities are readily noticed, but on smaller letters they should be reduced in proportion. For example, in letters an inch high the lower right-hand corner of N if brought to a sharp point projects  $\frac{1}{80}$  of an inch below the guide line, but in a letter  $\frac{1}{4}$  of an inch high this distance would be only about  $\frac{1}{100}$  of an inch, a very small quantity.

On small letters the sharp points on N A V M and W are best formed by stopping all strokes on the guide-lines and adding the point by a pen dot after the lettering is otherwise completed.

In the cuts accompanying, the letters are grouped approximately in the order of difficulty of construction.



I is the simplest letter to draw, and is the only one not requiring the preliminary square. After stroke 1 is in position stroke 2 is drawn at one unit's distance from it. The method of finding without dividers the thickness of a stem for a given height is to place a dot midway between top and bottom, and trisect one of these spaces as shown.

H. Mark off a square as gaged by the height of letter, cut off  $1\frac{1}{2}$  stems from the right-hand side, and the order of strokes is as indicated. To correctly place stroke 5 first bisect the height by a dot and draw 5 very slightly above this.

In L T E F and Z be careful to properly draw the spurs. These spurs as shown in Figure A should terminate at the free extremity in a hairline  $\frac{1}{4}$  of a unit long, and all spurs should be  $2\frac{1}{4}$  units long from the guide lines except the upper spurs of E F and Z which are 2 units in length.

L. Cut off  $1\frac{1}{2}$  stems from the square. If the next letter in a word following L is A, make the L only 4 or  $4\frac{1}{4}$  units wide.

T. Cut off 1 unit from its square, and make strokes 1 and 2 each  $2\frac{1}{4}$  units long. Next bisect the distance between them by a dot which enables strokes 3 and 4 to be quickly and accurately placed.

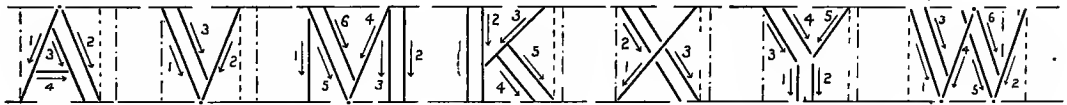
E is  $1\frac{1}{2}$  units less than square, and stroke 2 is a hair inside of 3. Stroke 5 is properly placed very slightly above the middle, by first bisecting the height with a dot. *Stroke 6 is half-way between 3 and 4*, and extends  $1\frac{1}{2}$  units either side of 5.

F. Stroke 5 is a trifle above mid-height, as in E, and 4 is midway between 2 and 3, and same length as the corresponding stroke in E.

Z. Cut off a stem from the square. Stroke 1 is 2 units long, stroke 2 is  $2\frac{1}{2}$  units long. Place a dot on the top guide,  $1\frac{1}{2}$  units from right-hand width-line, and stroke 3 extends from this dot down to the lower left-hand corner. Stroke 4 must begin exactly at the upper right corner and be parallel to 3. If necessary the directions should be shifted to make the inclined stem one unit thick.

In large letters inclined stems appear thicker than vertical stems of the same width, and the student will therefore have to be careful not to accidentally widen sloping stems while inking them.

N. Cut off  $1\frac{3}{4}$  stems from a square, and make strokes in the order given. Stroke 3 begins on 1 at a very small distance— $\frac{1}{5}$  of a unit—below the guide line and ends on 2 at the same distance below the lower guide line. Stroke 4 is parallel to 3 and at such distance as to make the stem a unit thick.



A. This letter may be brought to an acute apex at the upper guide, or made blunt as in plate I. If accurately made the acute vertex looks better, and should extend  $\frac{1}{5}$  of a unit over the guide line. To draw A, first draw a square, cut off a stem, bisect top of the rectangle by a dot and draw strokes as shown. Stroke 4 is drawn so as to apparently bisect the triangular area; its distance from the bottom should be two units. The usual mistake is to place stroke 4 too high.

V. Is drawn as indicated, using the dot on the lower guide to direct strokes 1 and 2. Its vertex extends, in the form of a hairline in small letters,  $\frac{1}{5}$  of a unit below the lower guide.

M. Strokes 1 and 2 of this letter mark off a square. After strokes 1, 2 and 3, a dot is placed on the lower guide bisecting the distance between 1 and 3, and strokes 4 and 5 meet each other  $\frac{1}{5}$  of a unit below this dot. Stroke 4 begins exactly at the intersection of 3 and the upper guide, but stroke 5 begins on 1 at  $\frac{1}{5}$  of a unit below the top guide. The usual mistake is to begin 5 too low on stroke 1, and the same error is frequently made in N.

The lower middle part of M is sometimes made blunt, as the top of A in plate I, and if this is done it should not extend below the lower guide.

K. After the square draw 1 and 2. Place a dot on the top guide  $1\frac{1}{2}$  units from the right side of the square; from this dot draw stroke 3 to meet 2 two units from the bottom. Stroke 4 is guided by placing a dot on the lower guide

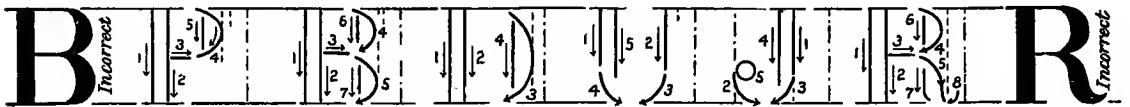
2 units from the square line, and another dot on stroke 3 one unit from 2. Stroke 5 is parallel to 4 making the stem of correct thickness.

X. Half a stem off a square gives its rectangle. Place dots on the top guide  $\frac{1}{2}$  a unit from the sides to guide strokes 1 and 2. The lower extremity of 2 should end on a dot  $1\frac{1}{2}$  units from the side. It may have to be shifted slightly, so that 2 and 3 shall be parallel and a unit apart, 3 to end just at the corner.

Y. Is placed in same sized rectangle as X. Bisect the bottom of the rectangle by a dot to guide 1 and 2, which are drawn indefinitely at first. On 1 two and one-quarter units above the bottom place a dot, and stroke 3 joins this with the upper left-hand corner. Stroke 4 is parallel until it meets 2. Stroke 5 joins the junction of 2 and 4 to the upper right corner. Beginners frequently make the inclined stem join the vertical one at the middle, instead of below the middle which is proper.

W. Add  $1\frac{1}{2}$  stems to a square and you have the rectangle containing the letter. On the lower guide place two dots 2 units inside the width-lines and draw strokes 1 and 2 to them. After stroke 3, bisect by a dot the distance on the top guide between 2 and 3 and from this dot draw 4 parallel to 2. If 4 thus drawn meets 1 on—or a hair below—the lower guide, finish the letter; if it does not, shift stroke 4 parallel to itself until in the proper position, when stroke 2 may be shifted a corresponding amount and the letter then finished.

Strokes 5 and 6 are parallel to 1. Stroke 6 should never fall to the left of 4. In letters less than  $\frac{1}{2}$  of an inch high, or in larger sizes if condensed, the portion of the stem 5-6 to the left of stroke 4 may be omitted and the middle part of W brought to an acute apex on the upper guide. A common mistake is to assume that the stems of W are parallel to that of V.



The lobes of B P and R are similar, and their correct shapes as given in plate I, should be carefully noted.

P is similar to the corresponding portion of B, with the exception that stroke 3 in P is a trifle below the middle. Stroke 5 is first made vertical and straight and then rounded at each end into 4.

B. The lower lobe is about  $\frac{1}{2}$  unit wider than the upper. Strokes 6 and 7 are made straight verticals at first and then rounded into 4 and 5; *but these two stems must be joined by hairlines*. This remark applies also to the R following. The effect of running the two curved stems together is shown in the first B, and is a mistake commonly made.

D. Its width is determined as in all the previous letters, by first drawing a square and reducing this by the correct amount. Make stroke 4 a vertical straight line first and then round its extremities into stroke 3. Guard against running the curved stem around upon the guide lines; as shown in plate I a

small portion of hairline should intervene between the curved stem and the guide lines at either extremity.

U. The method of construction is sufficiently indicated in the cut.

J. The left-hand portion extends up two units or more from the lower guide. Finish the lobe as a complete circle before filling in the angle between strokes 2 and 5 as shown in plate I. This angle, in small letters, needs little or no filling.

R is perhaps incorrectly drawn as often as any letter of the alphabet, the mistakes most frequently made being to run the two curved stems together, and to run the lower curved stem around upon stroke 8 as shown in the second R.



The curved parts of the letters C O and Q are arcs of ellipses. Not infrequently the beginner makes these letters of the general shape shown in the first O of the following cut, his idea being that the letter is circular, and that the curved stems must extend to the guide lines. Contrast the result with an O drawn after the shape suggested in the second one, which although somewhat extreme in this direction is more pleasing than the first example. The correct form is shown in plate I.

O. After drawing the rectangle place bisecting dots on each of the four sides to guide the strokes as given. Arcs 1 2 3 and 4 may then be joined to each other by straight (or nearly straight) lines. The verticals 5 and 6 are then rounded into the outline.

Curved stems should be slightly thicker than straight ones, that they may *appear* to be of the same thickness. See Figure B and remarks thereon.

The same general method used in O should be followed in making the outlines of Q C and G.

Q. Is made as an O first and then the lower curved distinguishing part is added. It is difficult to make this last part look neat. Two forms of the letter are given either of which may be used.

C. Stroke 4 and the upper spur of this letter must be carefully drawn. On the top guide in Figure A, at 7, is one of these spurs exaggerated to show that the sharp point at the top must extend as much beyond the guide line as the curved hairline accompanying. The corresponding parts of G and S are similarly extended a trifle over the guides. See plate I for correct models.

G, Stroke 1 should be inside of 7. The horizontal stroke 6 must be within  $\frac{1}{2}$  a unit of mid-height. The usual mistake is to get this too low.

S is usually counted the hardest letter of the alphabet to draw. Find the width-lines first, strokes 1 and 2 can then readily be placed, after which a method of making the other strokes is shown. Strokes 7 and 8 will usually require a little readjusting.

*Time must be taken* by the student to secure the proper form for the letters. The novice often fails to realize this. That plain roman letters look so simple when completed, does not signify that they are readily made, except by those who began carefully and have gained rapidity by practice. It saves time to begin with care. A habit, formed at the beginning, of making letters carelessly is apt to stick to a fellow through life.

The following cut exaggerates the results obtained by inaccurate work. Omitting serifs, the letters H O E V and Z have all been made the same height, width and thickness of stem. The H appears wider than it really is, the O too short and the stems not thick enough, the E and Z appear top-heavy although no wider at the top than at the bottom, and the sharp apex makes the V appear too short. The roman letters also appear slightly taller than the Gothic letters following.

H O E V Z      M O E A L

Figure B

The second part of the figure shows that optical illusions have also quite a share in determining the forms of Gothic letters. The letters M O E A and L in the figure are all of the same height, width, and thickness, yet they appear quite differently. Especially is this true of the O, as compared in width and height with the other letters.

These facts may help the student to be a little more patient in following the instructions given on the roman and Gothic alphabets.

The *order* of making the strokes, *in inking*, need not be that used in penciling but it is approximately the same. It will be better usually to make the upright and inclined strokes of the pen toward the draftsman, especially if a fine pointed pen is used. This kind of pen, a Gillott 303 or 170, according to large or small letters, will be used for roman and Gothic letters whose stems cannot be made at single strokes.

14. **Upright Gothic Capitals**—When Gothic letters are too large to have their stems made at single strokes, the direction and order of penciling the strokes given in the instructions following may be used. The Gothic alphabet is easier to draw than the roman, but the same method of drawing it should be used, that is, *use guide lines, squares and width-lines* as in the preceding article, and draw first those strokes whose positions are at once known and which then help in placing the remaining parts; the order of drawing these remaining strokes may be frequently varied from that given in the cuts, it will be found.

In the figures of this article, the 'square-lines' and many width-lines have been omitted, with the understanding, though, that they are to be used as in the preceding article. The widths of the Gothic letters are tabulated on page 8, or may be obtained from plate II.

**H** After cutting off  $1\frac{1}{2}$  stems from a square to obtain the circumscribing rectangle, the strokes are as indicated, 1 and 2 coinciding with the left and right sides of the rectangle respectively. Strokes 5 and 6 are correctly placed by first bisecting the height with a dot—the bar to be slightly above mid-height.

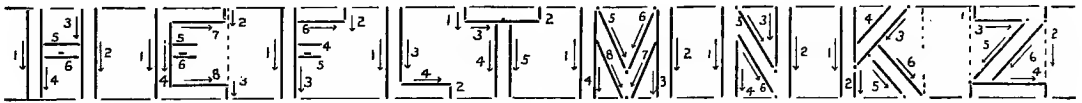
**E** The middle bar is placed by the use of a dot as in **H** and is half the length of the bottom bar. The top bar is  $\frac{1}{4}$  unit shorter than the bottom one.

**F** Central bar placed slightly above the middle as above, and is half the length of the top bar.

**L** Cut off  $1\frac{3}{4}$  units from a square to get its width. If the next succeeding letter in a word is **A**, narrow the **L** to 4 units

**T** Bisect stroke 3 with a dot to guide strokes 4 and 5.

**M** Is somewhat difficult to draw neatly, the trouble being to keep the junction of the inclined and vertical stems from being too thick without making the middle opening appear too large. After strokes 1 2 3 and 4 place a bisecting dot on the lower guide. Above this  $1\frac{3}{4}$  units, about, place another dot, and strokes 5 and 6 join this dot with points on the top guide about  $\frac{1}{5}$  of a space from 3 and 4. Strokes 7 and 8 are parallel to 6 and 5 respectively, making the inclined parts a unit thick. This should make the width of the middle portion on the lower guide less than a unit.



**N** After strokes 1 2 3 and 4, place dots at unit distances from 1 and 2, as shown at top and bottom. Stroke 5 begins at the dot on the top guide and ends on stroke 3 at a trifle less than two units from the bottom. Stroke 6 is parallel to 5 and must end on the lower dot. The inclined stem must not be over a unit thick.

**K** After strokes 1 and 2 place a dot on 2 two units above the bottom. Place a dot on the top guide half a unit from the right side and 3 joins this point with the dot on 2. On the lower guide place a dot  $1\frac{1}{4}$  units from the right side, and another on 3 at  $1\frac{1}{4}$  units from 2 to guide stroke 5. Strokes 4 and 6 are parallel to and unit distance from 3 and 5 respectively.

**Z** After strokes 1 2 3 and 4 place a dot on 3,  $1\frac{1}{4}$  units from the right side. Stroke 5 joins this dot with the left end of 4. Stroke 6 is parallel to and unit distance from 5, but must end at the intersection of 3 and the right width-line; some shifting of strokes 5 and 6 may be necessary to secure this.

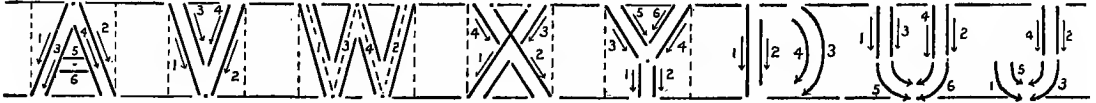
**A** Find its rectangle, bisect the top by a dot which guides 1 and 2. After drawing 3 and 4, place a dot 2 units from the bottom; strokes 5 and 6 are equidistant from this dot.

The vertexes of **A** and **V** may be made slightly less than one unit wide, but should not be wider than a unit.

**V** Bisect the bottom of its rectangle by the dot which guides 1 and 2. Strokes 3 and 4 are simply parallel to 1 and 2 and at unit distance as shown.

**W** Mark off the proper rectangle by adding  $1\frac{1}{2}$  stems to a square, then place dots on the lower guide about 2 units from the width-lines, and a bisecting dot at the top. These dots guide the auxiliary strokes 1 2 3 and 4 which guide the outlines.

**X** Place dots on the upper guide  $1\frac{1}{2}$  units from the width-lines. Strokes 1 and 2 join these dots with the lower corners as shown. Strokes 3 and 4 are parallel to 1 and 2 respectively and at unit distances.



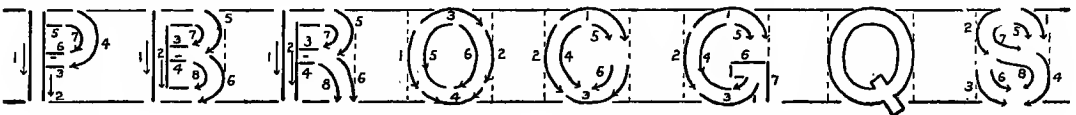
**Y** Find the center of its rectangle quickly by eye and place a dot half a unit below; this dot guides 1 and 2 (a unit apart) and marks their upper extremities. Strokes 3 and 4 join these upper extremities with the upper corners as shown.

**D** requires no special instructions, except to say that it is helpful to use bisecting dots to guide the curved strokes. Thus, a dot should be placed mid-height on the right width-line and stroke 3 is then made symmetrical with this dot.

**U** The outside strokes may be made first, if desired, instead of following the order given.

**J** Stroke 1 should begin  $2\frac{1}{4}$  units above the bottom.

**P B and R** The middle horizontals in these letters are guided by first placing dots at midheight. In **P** the bar is a trifle below the middle, in **B** a trifle above, while in **R** it may be placed at the middle.



**O C Q** As in the roman forms, the exteriors of the curved letters are better drawn first, in some such manner as shown, before the interior strokes are made. Use width-lines and bisecting dots, which help in making the exterior strokes symmetrical.

**G** Stroke 6 is but  $\frac{1}{4}$  unit below the center.

**S** One method of making the strokes is given; but methods of drawing this letter vary considerably with different draftsmen. Stroke 3 should begin 2 units above the guide. The middle portion of the letter should be almost horizontal.

All Gothic curved letters, also, should extend a trifle over the guide-lines, to cure the optical defects shown in Figure B.

15. **Numerals and Inclined Capitals**—The instructions of the preceding two articles will be found a sufficient guide, it is believed, for the construction of the large roman and Gothic inclined capitals shown in plate IV.





# FREEHAND LETTERS

## *Single Stroke Roman*

*A B C D E F G H I J K L M N O P Q R S T U V W X Y Z*

*A B C D E F G H I J K L M N O P Q R S T U V W X Y Z*

*abcdefghijklmnopqrstuvwxyz*

## *SINGLE STROKE GOTHIC*

*A B C D E F G H I J K L M N O P Q R S T U V W X Y Z*

*A B C D E F G H I J K L M N O P Q R S T U V W X Y Z*

*RE-ISSUED - AUG 20 - 97 - B*

1542

**PENNSYLVANIA LINES WEST OF PITTSBURGH.**

**SOUTH-WEST SYSTEM**

**TENDER, ALL CLASSES:  
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18

SUPT. M.P.

CHIEF DRAFTSMAN

*This is a Style of Lettering Used in The Engineering News  
For Single Stroke Roman and Stump Letters and Figures a  
fine pointed pen should always be used*

**FOR SINGLE STROKE GOTHIC LETTERS AND  
FIGURES A BALL POINTED PEN SHOULD ALWAYS BE USED**

*1 2 3 3 4 5 6 7 8 9 0*

*1 2 3 4 5 6 7 8 9 0*

**A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**

The instructions for inclined single stroke roman and Gothic capitals follow. See plate V and articles 16 and 18.

From plates I and II and the suggestions preceding the student may devise his own method of forming the roman and Gothic forms of the arabic numerals. It is as important to know the correct forms of figures as to know the letters, so they should be carefully practiced.

**16. Single Stroke Roman**—The stems, hairlines and serifs of the capitals accompanying stump letters, unless the latter are unusually large, are made rapidly by single strokes as shown at the top of plate V. The directions for forming these letters can be seen from the alphabets there given, the first one showing the order in which the strokes are made, the second a completed alphabet. The direction of making the strokes, unless otherwise indicated by an arrow, is in all cases downward for vertical or slanting strokes, and from left to right in horizontal or hairline strokes. The instructions given are for pen strokes, and a sharp pointed pen is used as in stump letters. Only two guide lines are needed.

Although we have called this alphabet single stroke roman, yet a few of the letters can not be made by single strokes. The middle portion of S will require retouching as in the stump letter. Also the spurs of E F L T and Z will need retouching after the letters are otherwise complete. In small letters these spurs need but a mere pen dot to fill them enough.

After completing the letter A by drawing the two serifs on the lower guide line, the letter may be improved by enlarging the junction of stroke 1 with the serif below ; but the beginner must guard against making this enlargement too heavy, otherwise it had better be left alone. Similar portions of the letters K M N U V W X and Y may be treated in the same manner (see plate I for correct forms).

Stroke 4 in the letter G is a short heavy stroke tapering to a point at the lower extremity, and at its upper extremity covering a portion of stroke 3. The acute angle between strokes 1 and 2 may be advantageously filled a little, if too much ink is not used. Similar portions of the letters C and S may be treated likewise, if the letters are not too small.

Strokes 1 in V, and 1 and 3 in W, should stop short of the lower guide line, the lower apex being made acute by the hairline stroke 2 in V, and by hairlines 2 and 4 in W. The upper apex in the letter A may also be made acute in this way.

The figures are just as important—more so in some drawings—as the letters and should be as carefully practiced. Directions for forming them are given in the lower portion of the plate. The height of figures, if used in connection with stump letters, may be a trifle less than that of the corresponding capitals. To illustrate, in the following, *September 1902*, the figures appear slightly too large to match the letters. If the word is printed in capitals thus, *SEPTEMBER 1902*, the figures appear slightly too small to match, and may be enlarged a very small amount, accordingly.

Upright single stroke roman letters may be formed after the methods just given for the inclined. The inclined letters though, are more easily made (presumably because we incline our handwriting) and are more frequently used.

**17. Stump Letters**—In stump letters the direction and order of making the strokes are most important. The following cuts sufficiently indicate the method of forming each letter, and need but few comments.

In speaking of the four guide lines we will refer to them as numbered from the bottom to the top.

(a) *These instructions relate to drawing the letters with pen.* To be sure of the spacing and spelling it will frequently be found convenient to sketch the letters roughly in pencil first.

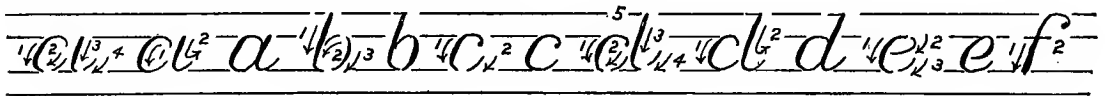
(b) *Use a fine pointed pen.* For letters  $\frac{1}{10}$  to  $\frac{1}{8}$  of an inch high use a Gillott 170, or equivalent; for larger letters use a Gillott 303 slightly worn; for very small letters use a Gillott mapping pen, or equivalent.

(c) *Use four guide lines as shown.* With a little experience the draftsman will need only the two middle ones. The distance between the first and second, and between the third and fourth, is  $\frac{2}{3}$  of that between the second and third.

(d) *All strokes are made downward toward the draftsman, except the few horizontal strokes which occur.*

(e) *Straight stems and the axes of curved ones slope at 3 horizontal to 8 vertical.*

Some draftsmen make the stems downward and the hairlines upward as shown in the second *a* and *d* of the first cut. If this is done the hairline as stroke 4 in *a* is apt to make too acute an angle with the stem. Also, in such letters as *b*, stroke 2, if made upward, is apt to drag the ink from the stem into the angle. Another objection to making the hairline strokes upward is that the pen is more apt to catch and splash if the paper is rough; but, of course, smooth hard paper is preferable for lettering.

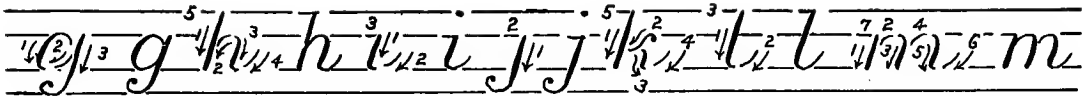


*a.* The upper hairline of stroke 1, and similar portions of *c d g q* and *s* may be made downward as a separate stroke, if the letters are very large.

*c.* The upper part of stroke 1 may be otherwise made as in the corresponding part of *r*, if desired.

*e.* Stroke 2 may be retouched at the angle, after the letter is finished, to make it resemble the roman lower-case letter.

*f.* In another form of this letter the stem extends below the second guide and ends as *g* does. The form given is simpler and looks as well if properly made. If the letter is large be careful not to drag the ink from the stem in crossing with stroke 2.

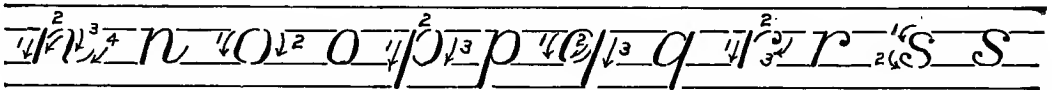


*i.* The dot must not be placed too high. On or a little below the fourth guide is preferable. This applies also to *j*.

*k.* Do not crowd strokes 2 3 and 4 together too closely; it is a common mistake to do this.

*l.* Stroke 1, similar to corresponding strokes in *b* and *d*, ends with a short hairline to the right, with which stroke 2 connects.

*m.* Stroke 1 is a straight stem; stroke 3 begins with a short hairline; stroke 5 begins and ends with a short hairline. Be careful to make these strokes parallel and at proper distance apart.

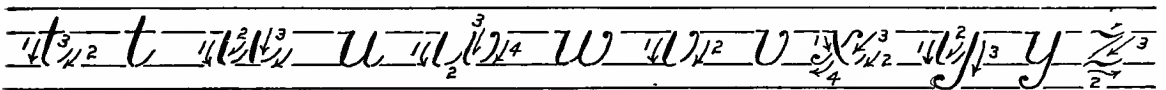


*o.* Never attempt to make this letter at one stroke, as beginners frequently do.

*q.* Stroke 3 is a straight stem without serifs.

*r.* Strokes 2 and 3 correspond to the upper portion of stroke 1 in *c* and *s*, but since this is the distinguishing part of the letter it should be drawn carefully as indicated.

*s.* Stroke 1 is so sinuous that no attempt need be made at first trial to keep the heavy part of proper thickness throughout. It can be retouched by an extra stroke, after the letter is otherwise complete.



*t.* Stroke 1 begins halfway (or a little above halfway) between the third and fourth guides. Stroke 3 is a quick hairline stroke on the third guide. The precaution noted under *f*, should be taken with this stroke.

*u* is practically two *i*'s put together, with the serif left off the second one.

*v.* The serifs of the letters *v* *w* and *y* are replaced by curved hairlines by some draftsmen. Still another form of making these letters is shown in plate V in the word 'always' in the second line of stump letters below the central title.

*x.* After making stroke 1 be careful not to drag the ink into the lower angle when drawing the hairline across. For this reason the latter stroke had better be made in two parts as shown.

*z.* Turn the pen sideways to make strokes 1 and 2.

All strokes in stump letters are intended to be made quickly, and with an hour or two of persistent practice the student should get the 'swing of it'.

Indeed, the writer never learned to make stump letters properly until obliged once to spend two weeks in drawing nothing but stump letters. The letters were used to mark the names of the postoffices and streams on a state map.

The serifs of stump letters are usually the last strokes made in each letter, and are then made as short quick hairline strokes. The proper capital for stump letters is the single stroke roman explained in the preceding article. The *stems* of capitals corresponding to the letters in the above cuts, should extend from the second to the fourth guide line, and should properly be *only slightly thicker than the stems of the stump letters*.

18. **Single Stroke Gothic**—Upright and inclined Gothic single stroke alphabets are given in plate IV. These two alphabets are extensively employed in technical work, because so legible and quickly made. In plate V the method of making the inclined letter is given, and the same method may be used in making the upright form. In either case a ball-pointed pen should be used, that all the lines may easily be kept the same thickness. The effect of using a fine-pointed pen is illustrated in the words Re-issued—Aug. 20—97—B (in plate V) which were taken from a drawing the title to which appears at the central portion of the plate. Glancing at the letters E, it will be seen that the horizontal strokes are not as thick as the slanting strokes, and were so made incorrectly, probably by making the strokes side-ways with a fine-pointed pen. Even when a stroke is made toward the draftsman, if a fine pointed pen is used, it is difficult to keep all parts of uniform thickness, so always use the proper pen.

After what has been already said little need be remarked about these letters. As is natural with other single stroke styles, it is natural and easier to draw inclined strokes toward the draftsman ; but, since a ball-pointed pen is meant to glide as smoothly in one direction as another—at the same time making a line of uniform thickness—much more freedom is allowed in the direction and order of making the strokes in this alphabet. In the plate, unless otherwise noted, slanting strokes are supposed to be made downward, and horizontal ones from left to right.

After what has been said on the freehand alphabets preceding, little need be remarked about these letters.

Stroke 2 in K begins on 1 about two units from the bottom and may be made upwards. Stroke 3 should be far enough away from 1 to keep the letter from appearing cramped.

With a little practice the letters M N and W can be more rapidly made by taking the strokes in the order given in the plate, otherwise the beginner should draw the outside strokes first.

As stated before, the figures are as important as the letters and should be as carefully practiced. A common mistake is to bring the middle portion of the numeral 2 down into its lower horizontal part at an acute angle as shown in the line Re-issued—Aug. 20—97—B. The middle portion of this figure should be almost horizontal as shown in the correct forms at the bottom of plate V.

Beginners frequently make the letters of a drawing carefully and then use written forms of figures. The remark that *no handwriting should be allowed on a drawing, applies also to figures.*

19. In **Mechanical Engineering** the style of letters used on drawings is usually of the simplest character. Roman, Gothic, and stump letters, or some modification of these, are commonly employed, the Gothic letters being, perhaps, used more than any others. The letters given in plate V are all suitable to use in mechanical drawings.

In the center of the plate is a title taken from a drawing made in the motive-power department of a well-known railroad. It will be noticed that the letters are all of the plainest character, consisting of large and single stroke Gothic styles. Formerly in this department Round Writing was used, but the occasional ambiguity, caused by an extra flourish of a draftsman's pen, proved serious enough objection to cause a change. Printed forms of a portion of the titles are kept on hand, and the draftsman traces this and adds the special name and number of the drawing. In the title given, the words Tender, All Classes; Draft Rigging Details, together with the number 1542, and the draftsman's initials, A. R. H., form the especial title, the other words and figures all being copied from the printed form. In this way all the titles are lettered uniformly, and, all titles appear at the lower right hand corners of the drawings, for ready reference when they are filed in cases. The rectangle at the lower central portion of the title, is for the stamp of the office, which indicates the date of issue of the blue print, none but blue prints being sent from the office. To the right of this is the date of the drawing and the chief draftsman's signature. To the left is the signature of approval by the superintendent of motive power. No scale is given in the title; since the measurements must be exact, they are therefore all marked on the details. Should any dimension be omitted by oversight, it is asked for by telegraph, the number of the drawing, 1542 in this case, easily and unmistakably designating the proper drawing. The number 1542 is the serial number of the sheet, all drawings being numbered consecutively in the order of their production.

For lettering the details of the above drawing, single stroke Gothic letters such as are shown in the words Re-issued—Aug. 20—97—B are used. The sizes of the letters vary with the importance of the details; and the smaller Gothic letters are capitalized by larger letters of the same style. The first issue of a drawing is known as issue A. The design of the chief draftsman is tested on the road or in the shop. If changes are desired or recommended by the superintendent they are made in the chief draftsman's office, the original number of the drawing being retained, and the number of the edition is indicated by a letter. In the case cited, the words just quoted above, which were taken from the same drawing on which the title given above appeared, indicate that the original has been amended once and is now, Aug. 20, 1897, re-issued. The letter C would indicate that the drawing had been amended twice.

It has been said that lower-case Gothic letters, such as are given in plate IV, are difficult to make, and hence are little used in technical drawing. However, an example of a style of Gothic lower-case is given just below the title in the middle of plate V, which is easily made, looks neat, and is very appropriate for mechanical drawings. Explicit directions for forming this style, and upright letters of the same kind, with accompanying capitals, are given in a book written by Mr. Chas. W. Reinhardt, chief draftsman of the Engineering News.

For title words in mechanical drawings, Gothic letters with shade lines drawn partly around them, are easily made, and look quite well. An example of this is given in the alphabet at the foot of plate V; in this alphabet the Gothic letters were quickly drawn by single strokes with a ball-pointed pen, and the shade lines added with a fine-pointed pen. Block letters, also, are often seen in the titles of drawings appertaining to mechanical engineering.

20. **Architectural Letters**—In architectural drawings lighter and more artistic styles of letters are allowable than in the more technical classes of work.

Architectural drawings are, to a greater extent than other drawings, made for public display or inspection, and on this account more *elaborate* or fanciful styles may be used; also, in such drawings there is usually an absence of black, heavy outline, and to harmonize with this a *lighter* form of letter than usual is suitable.

As in so many other classes of work, the roman letter is made to do service in architectural drawing, in either its plain form with the outlines only, inked in, or in one of its many modifications. A modification of the roman alphabet, known as a variety of Roman Old Style, is shown at the top of plate VI; another modification is shown at the bottom of the same plate, and either one of these styles is appropriate for use in the titles of architectural drawings which do not present too heavy an appearance otherwise.

The second alphabet from the top, in plate VI, together with the letters and figures next above the last alphabet in the plate, are illustrations of more fanciful styles. These letters are better suited for title words than for detail work, as they will generally require too much time to be extensively used. However, they are more easily made than they appear at first sight. Permission to give these styles was kindly given by the draftsmen whose names appear in the plate.

In the central part of the plate is given a freehand title adapted from one on a competitive design, for the improvements at the U. S. Military Academy, submitted by Carrere & Hastings, Architects, New York. A copy of the original may be seen in the Architectural Review for July 1903. It makes an excellent display letter and may be quite rapidly drawn freehand, although better results still may be had by using right-line and bow pens. Notice that all letters in the same line are of one height irrespective of the importance of the words.

The words Universalist Church are copied from the words as they appear upon a stone tablet in an existing structure. They exhibit another style of modifying letter forms to serve an architectural purpose.



## ROMAN OLD STYLE

A B C D E F G H I J K L M N O P Q R S T U V

I 2 3 4 5 W X Y Z 6 7 8 9 0

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

UNIVERSALIST CHURCH

*DETAIL OF CABINET PARTITIONS IN PRIVATE OFFICE**End of Cornice**SECOND FLOOR*

## -GENERAL-PLAN-

-SCALE - ONE - INCH - EQUALS - ONE - HUNDRED FEET -

-SHOWING-PROPOSED-

-TREATMENT-OF-GROUNDS-AND-BUILDINGS-

-OF-THE-

-UNITED-STATES-MILITARY-ACADEMY-

-WEST-POINT - NEW-YORK -

Clarence White

with --

Geo. F. Barber &amp; Co.

Robert D. Richards --  
Geo. F. Barber & Co. with

Knoxville Tennessee

a b c d e f g h i j k l m n o p q r s t u

a b c d e f g h i j k l m n o p q r s t u v x y z

1 2 3 4 5 6 7 8 9 0

A B C D E F

1 2 3 4 5 6 7 8 9 0

G H I J K L M N O P Q R S T U V W X Y Z



Some architectural draftsmen in using the roman or modified roman letters for title words, replace the letter U with a V. This mars the legibility of a word, and is for this reason objectionable.

**21. Type Specimens**—In plate VII are given some type alphabets selected from the catalogues of the American Type Founders Co. and of Barnhart Brothers & Spindler. In the upper part of the plate are given standard type forms of letters and figures for engineering drawings. In the lower portion of the plate are given some less technical type forms, which are appropriate for architectural work.

Type forms really set the standard. To say that the lettering on a drawing "looks just like print" is usually the highest compliment it can be paid. People who read, are accustomed day after day to see type letters of either standard styles or of modified styles, which are of recognized merit. If, therefore, on a drawing the lettering in general follows a type form, but departs irregularly from it, the draftsman is pretty sure to be criticised. Also, since type forms have so much influence, it is possible, although it may not be desirable as viewed at present, that the standard styles set by type forms a few years hence, may not agree with those of today.

Type specimens, therefore, are worthy of careful observation and study.

(For mention of title given in the center of plate VII, see article 30).

**22. Remarks**—The following extract taken from the preface of Prof. C. B. Wing's little pamphlet on freehand lettering is to the point: "The importance of freehand lettering seems to have been disregarded heretofore. The alphabets that have been previously given are adapted almost exclusively to the elaborate lettering of drawings that are to be engraved. In such cases time may be profitably spent on the drawing, because it becomes a small item when divided among a great number of prints. Working drawings, however, are blue printed only a few times, and the lettering must be done quickly or it costs too much. No one thing is more helpful to the young draftsman in gaining the confidence of superintendent and workmen, than the ability to letter a drawing quickly, neatly, and so plainly that no workman can ever make a mistake because of inability to read words and figures."

"The author believes that every person can acquire a hand for lettering as well as for writing, and that nearly as much originality is shown in one as in the other. It is recommended that beginners try copying several of the styles given; that they choose the one which seems easiest; and that they practice this with great persistence till they are able to reproduce it well and quickly. The acquiring of one hand gives facility in acquiring others."

"In some offices all draftsmen are expected to adopt the same style of lettering, in order to attain uniformity in the drawings. The author has in mind a set of standards for wooden trestle bridges in which the different plates were drawn by four or five different men; the lettering has a uniform appearance, but a careful examination will show the individuality of each hand."

"Nearly every one can learn to do good freehand lettering by careful,

persistent work ; but if any one should fail, he may select one of the geometric forms, using the right line pen and straight edge, and then strive to acquire speed in execution, without a sacrifice of legibility.”

ABCDEFGHIJKLMNOPQRSTUVWXYZ&

abcdefghijklmnopqrstuvwxyz

Cape

1 2 3 4 5 6 7 8 9 0

Town

*ABCDEFGHIJKLMNOPQRSTUVWXYZ&*

*Lake*

*1 2 3 4 5 6 7 8 9 0*

*Tsad*

ABCDEFGHIJKLMNOPQRSTUVWXYZ&

Steam

1 2 3 4 5 6 7 8 9 0

Crane

abcdefghijklmnopqrstuvwxyz

LAW ITALIC

*A B C D E F G H I J K L M N O P Q R S T U V W X Y Z &*

*12345*

*abcdefghijklmnopqrstuvwxyz*

*67890*

LOCK WITH 10 FEET LIFT

DETAILS OF

UPPER PORTION OF LOCK

OUTING

ABBCDEFGHIJKLMNOPQRSSTUUVWXYZ&

RESIDENCES

1234567890

QUAINT OPEN

ABBCDEFGHIJKLMNOPQRSSTUUVWXYZ&

PASSENGER

1234567890

ELANDKAY

ABBCDEFGGHIJKLMNOPQRSSTUUVWXYZ&

ELEVATION

1234567890

DEVINNE ITALIC OUTLINE

*ABCDEFGHIJKLMNOPQRSTUVWXYZ&*

*1234567890*

Macadamize

DEVINNE

1234567890

ABCDEFGHIJKLMNOPQRSTUVWXYZ&



## Chapter III.

# TITLE LETTERING.

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**23. General Considerations**—The title to a drawing should answer distinctly the four questions, what, where, when, and who. In other words, the title should tell what the drawing represents, for what use it was made, and to what scale it is drawn ; where the tract or object represented is located, and where the drawing was made ; when, giving the date of the survey or design, and the date of drafting ; who the designer or chief engineer is, and who did the drafting. Thus in plate VIII, where several examples of titles are offered for discussion, the first title given answers these questions.

*The different parts of a title should be made prominent in the order of their relative importance.* Thus, taking the above mentioned title as an example, the words Chattanooga to Stevenson, Ala. are made the most prominent, because we are supposing the entire line to be profiled in two or more sections, each section being profiled on a separate sheet or roll of paper, and one section embracing that part of the line between Chattanooga and Stevenson ; it is desirable to know at first glance which part of the line the profile in hand represents, and the words Chattanooga to Stevenson tell this. If the profile represented the whole line complete on one piece of paper, then " East Tenn. and Ala. R. R." should have been the most prominent. The other words are lettered to catch the eye in the order of their importance. The second title, given in plate VIII, is taken from the records in the office of the Ohio State Canal Commission. Here the several canals of the State have been mapped by sections, each section being drawn on a separate sheet. The sheets are bound in book form, one set of books to each canal, and the title mentioned above has been taken from the set showing the Miami and Erie canal. The portion of this canal lying in Cincinnati, having been drawn in several sections, the words, in the title selected, in the order of their importance are " Eggleston Avenue," " Cincinnati, Ohio," and " Miami and Erie Canal." Of course the draftsman should know beforehand the order of the importance of the words before he begins to draw the title, and sometimes when a number of different drawings are made in series, it will require considerable thought to arrange the styles and sizing so as to obey the rules already given and at the same time have all the titles appear uniform, and have each title harmonize with the drawing on which it appears.

Where drawings are made to illustrate written descriptions, or are accompanied by written descriptions, the title is, of course, often not so comprehensive. When the drawing represents some familiar object, a simpler title is also often used. Thus the last title shown in plate VIII is an example. Such a title might be used on a drawing, made for public display, of a well known tract of

land. However, it is a good rule to make drawings as nearly as possible self-explanatory, and there is little or no danger of getting too much information on them in a neat and concise form, even though they may be accompanied by full written descriptions.

The descriptive part of a title is sometimes placed in small print on another part of the drawing, apart from the main portion of the title.

**24. Position of the Title**—The title should be so placed on a drawing as not to appear cramped. It is sometimes placed outside the border, especially when it consists of a single line of letters, but this rule should not be followed when a suitable place can be found inside. A general rule is to place the title above or below the center of the drawing, near, but not too near, the border, and if the drawing is symmetrical, the title should have the same axis of symmetry. If the drawing is unsymmetrical, the title may be placed in either of the corners. In drawings of irregular objects, maps of irregular tracts and the like, the title may be put wherever the shape of the drawing affords the best space, considerable freedom being thus allowed.

On drawings which are too long to be seen at one glance, as profiles or roll maps, two or more titles, if necessary, may be used at convenient distances apart. Where a series of drawings are to be made for permanent records, and are to be filed away in drawers or cases for reference, it is often desirable to have the titles on the separate sheets appear in the same corner in each one, for convenience in handling. When this is the case the selected corner should be reserved for the title beforehand on each drawing. The lower right-hand corner is the one usually chosen in such a case, but any one of the others may be selected if desired. The matter is determined often by the shapes of the plats.

**25. Size of the Title**—In the first place the size of the title, as a whole, should be in proportion with the drawing. For drawings of small scale the title should usually be smaller than the title of a drawing of larger scale on the same sized sheet. The following specific rule may be found helpful: When a drawing held in position has its longest border horizontal the length of the title should not be greater than one-fifth the length of this border, and the height (width) of the title should not be greater than one-fourth the length of the shortest border. Even this rule often allows too large a title.

The largest letters of the title, which will generally be used for the name of the machine designed, the locality mapped, the structure planned, or the like, should not be greater in height than  $\frac{3}{100}$  of the length of the shorter border; the smallest letters of the title will usually be used for the date, the draftsman's name, and for explanatory notes, and between these two sizes the other words of the title will require letters of intermediate sizes, according to their relative importance. For a scale of 1:10,000 (1 inch = 833 $\frac{1}{3}$  feet) Reed gives the following practical rules for maps: "Make the largest letters of the title, for a map of about two feet by three feet dimensions, three-tenths ( $\frac{3}{10}$ ) of an inch in height. For a map of about one foot by one and a half feet dimensions, make the largest letters of the title two-tenths ( $\frac{2}{10}$ ) of an inch in height, and



proportionally for maps of other dimensions ; and since explanatory notes are always very small letters, the intermediate grades are readily assigned."

**26. Form of the Title**—The form of the title may vary considerably according to the size and shape of the space in which it is placed. When the space allotted is high and narrow, the title should be designed as nearly in harmony as possible. Where the title must occupy a long space, which is not very high in proportion, the letters of the title may be correspondingly flat, and to gain this end the letters may be extended as in the word *Extended* in plate III. The title must be distinct and not appear to be cramped, nor must the lines of letters be so far apart as to give the title a loose or disconnected appearance.

Sometimes the title consists of one or more lines of letters across the entire top of the drawing, but generally it will consist of straight lines of letters grouped as in the second title given in plate VIII, or of some simple combination of straight and curved lines of letters as the first title given in the same plate. When the lines or rows of letters are curved, usually arcs of circles are used, with the center of the arc on the axis of symmetry. Other forms may be devised, but some such simple combination as either of the ones illustrated are generally employed. One form of title that is seen occasionally is in bad taste ; it is the form in which the curved lines sag towards (are convex towards) the central line of letters. When the letters are arranged in this manner the curved parts tend to give the impression that they have no connection with the rest of the title. The curved lines should be arranged concave towards the central line, as the word *Profile* is towards the line of letters *Chattanooga to Stevenson, Ala.*, in the first title given in plate VIII.

Where the space allotted to the title is irregular in shape there is often room for much ingenuity in arranging the title to harmonize with its surroundings. Where titles are required for elaborate drawings, which are made for display or similar purposes, title lettering becomes an art by itself. An example of a more elaborate title is given at the bottom of plate VIII, but it is rarely necessary for the engineer to make such a one.

**27. Construction of the Title**—The construction of a title is illustrated in the second one given in plate VIII, to which reference through the following discussion should be made. Having determined the position, size, and form of the title, and which words should be given most prominence, rule pencil lines for guides as shown, parallel to the bottom of the drawing. Then write on scratch paper and number the letters of the main words, thus :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	G	G	L	E	S	T	O	N		A	V	E	N	U	E,

counting also the space, or spaces between words. We see that the whole number being sixteen the center line should be between the eighth and ninth letters, *provided* all the letters and the spaces between words are of the same width ; but we already know that letters are not all of the same width, and

suppose, in the present case, that we wish the interval between the words to be a little narrower than the space occupied by an average letter, which is the usual distance allowed between words. Noticing this point, and that the letters A and V are the widest letters of the row and occur on the same side of the center, but are spaced slightly closer together, as explained previously, we would say as a first approximation that the center line comes nearer the O than the N in the word Eggleston. Accordingly we begin near the center and pencil in the letter N, then space off the interval between the two words, and pencil in "Avenue." With the compass measure off to the left of the center a distance equal to that from the center line to the end of the word Avenue, and at the point thus found begin to pencil in "Eggleston." Now, if the position of the center line relative to the row of letters has been correctly estimated, the letters will fall in their proper places; if not, the work must be erased and another trial made; by erasing a few of the letters near the center slight discrepancies may be adjusted. The advantage of lettering one-half the row at a time in this way, is, that if the first approximation is not right, usually only a few letters near the center need to be erased to gain the proper adjustment, whereas if we begin at the left-hand end first and letter through the row, the whole row might have to be erased.

Suppose that the next line of letters in the same title we wish to be shorter and smaller, and we mark the limits as shown by the short vertical lines at equal distances from the center. In this case suppose we do not wish to take the time to mark the letters on scratch paper and number them, now that we have one line of letters penciled in already as a further guide. If we begin at the left-hand and letter through to the right, the last letter may fall outside, or partly outside, the limiting line as shown, and we would have to erase and try over again. It would be better to pencil the word "Ohio" backwards from the right-hand limit and then commence at the left-hand and pencil in the first word, allowing any small discrepancy to fall in the space allowed as an interval between the two words, for, this space does not have to be so exact as that allowed to a letter. This method of lettering from extremities towards the center, illustrates a second way of penciling in the rows of letters.

If the axis of the title is not that of the sheet, the longest line of letters, or the most difficult line, may be lettered from left to right in the usual way, its length bisected and the axis taken through the mid-point. The remaining lines are then fitted to this axis as above. Portions of a title which have to be repeated frequently, on the same sheet or separate sheets, may be drawn on a slip of paper and transferred each time. The draftsman as he progresses will find a number of methods of shortening the labor of drawing a title.

Thus we see that the process of sketching in the lines of letters of a title first explained is a series of approximations; but the practical draftsman does not stop to measure precisely the difference in width between the different letters and intervals to calculate exactly where the center line would fall, but from a casual consideration of these points and from previous experience, he estimates

EXAMPLES OF TITLES

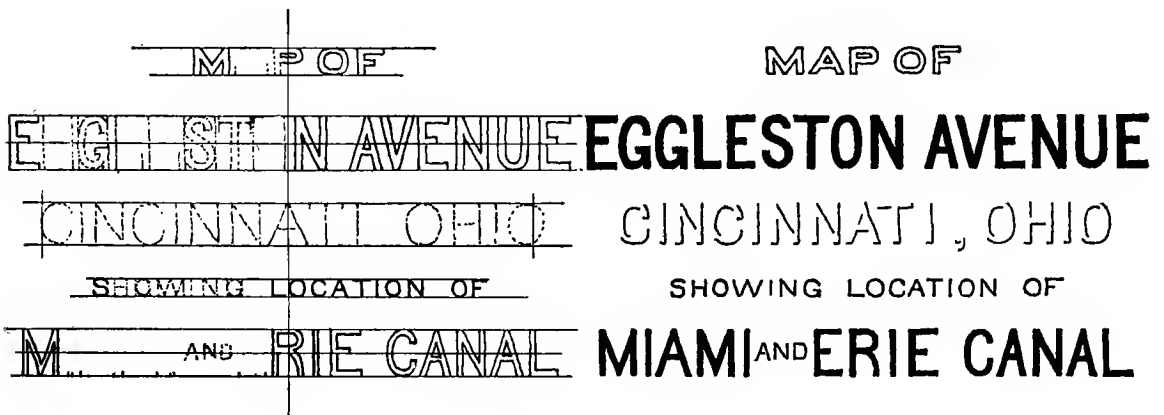
PROFILE  
OF THE  
**EAST TENN. AND ALA. R.R.**  
**CHATTANOOGA TO STEVENSON ALA**  
**LOCATION SURVEY MADE 1887**

**J.C. BREWER CHIEF ENGINEER**

PREPARED FOR THE DIRECTORS OF THE  
EAST TENNESSEE VIRGINIA & GEORGIA RY.

VERT. SCALE 1 IN = 20 FT. HOR. SCALE 1 IN = 400 FT.

CH'F ENGRS OFFICE CHATTANOOGA — — — DRAWN BY C.E. SHERMAN SEP 1889



PROPERTY  
OF THE  
**CHEROKEE**  
**LAND IMPROVEMENT**  
**COMPANY**



where the center would fall, and is usually able with few or no changes to correctly pencil in the line at the first trial. It is a mistake beginners sometimes make to think that the middle letter of the row should fall on the center. The letter P, in the first line of letters in the title we have just discussed, happens to fall at the center, because the letters M and A on the left of the center are wider than the other letters in the line, and the interval between words on the right of the center has, for compactness in this case, been made smaller than usual.

The beginner should also be cautioned about getting the lines of letters too far apart. The distance between two rows of letters in a title should seldom be greater than the height of the largest letters on either side of the space we are considering. The whole title should, of course, be drawn in pencil before being inked in, the pencil lines being afterwards erased.

28. **The Style, or Styles of Letters** to be used in the title should be appropriate to the drawing as a whole ; they admit of more variation, however, than the lettering on any other part of the drawing. The letters of a title may all be of the same style, differing only in size, they may all be of the same style and shaded differently, or they may be of different finish and size in the same title.

‘The letters should correspond in conspicuousness, or body of color, with the rest of the drawing, not being obtrusive from great heaviness of solid black outline, or unobservable from excessive faintness. Also violent contrasts of heaviness among neighboring portions of the title should be avoided ; although there may be a gradual change both of intensity and size from the most to the least important words of the title. Plain and simple titles look best on similar drawings, while a complicated and highly finished drawing may receive a title of a more ornamental character.’

Plate IX gives an idea of some of the styles used in mechanical drawings. The first title was invented, and shows about the maximum limit of artistic lettering employed on a mechanical drawing, that is to be sent away from the shop. The remaining two titles were taken from actual designs, and show that it is customary not to use so many styles as exhibited in the first example. The central title is a fairly representative one, and some of the letters show that the individuality of a draftsman may be displayed in lettering almost as plainly as in handwriting. The last title shows how simple are the styles usually employed on a mechanical drawing, and, if the drawing were intended for shop use only, the lettering would be even simpler still. The flourishes or space-fillers to the left of “R. Hoe & Co.” are used to balance the title. They save time for the experienced draftsman occasionally, because when they are used not so much pains need be taken to balance the lettering. Another example of their use is shown in the first title in the plate.

Plate X shows some freehand architectural titles. The central one is a heavy title made by single strokes of a Payzant pen, and is of weight suitable for a drawing of somewhat heavy outline, and, for detail letters on the same

drawing, those shown in the lower left-hand corner are suitable. The title at the upper right-hand corner shows a 'colonial' style now frequently used. The wide spacing in the first and last lines of the title would not be so appropriate with other styles. In the upper left-hand corner is a title designed to fill a panel. Some of the letters of this title show that shading may also be employed in architectural letters to make a title match its drawing. This title, with several others in the plate, illustrate a method of avoiding spacing letters from a central line. Just above the central title is a sketch letter suitable for a perspective sketch, or freehand drawing of some proposed building or interior treatment, used only in hastily gotten up drawings. The lettering in the lower right hand corner is self-explanatory. The lettering above that in the lower left hand corner, shows a very useful style now much in vogue in architectural work. It is easily and quickly made and is suited in character to much of the work of the architect. It shows the tendency of architects toward using simple styles.

The matter of punctuating the title varies considerably in practice. Usually the words are so arranged that no punctuation marks are required, except for abbreviations, and the periods after well known abbreviations may even sometimes be omitted. *It is best, however, to print all the words in full,* unless there is not room enough, or unless the title would appear entirely too cramped in the space in which it is to be placed. The title should not be conspicuous for its punctuation marks, nor conspicuous for their absence where they are needed. In any case it should be so executed that no mistake can possibly be made as to its meaning. The title pages of books furnish illustrative examples for study.

To add to the effect of a title, or relieve it from undue stiffness, flourishes are sometimes employed. This is illustrated in the title given at the bottom of plate VIII. In the first title given on the same plate, in the last line between the words Chattanooga and Drawn, is a flourish. Some such flourish as this, two examples of which are given in plate XI, may be placed between rows of letters which are too far apart horizontally or vertically, to relieve the undue stiffness. Two other simple designs for flourishing are given in plate XI, at the right and left of the central scale designs, one of which, or some similar design, might have been used in the above mentioned title, had the words Profile of The been arranged on one curved line, leaving too much white space between it and the next line below, the flourish being used to partially fill this space. But where flourishes are used they should be simple in design, for it is easy to overdo the decoration.

Titles placed on banners or fluttering ribbons, or amidst landscape sketches on technical drawings, are waste of time, and, besides, are nearly always in bad taste. As in the rest of the drawing, no handwriting should be allowed in the title.

29. **When to Ink the Title**—The title of a drawing should be inked in last ; for, after all the other details of the drawing are finished the draftsman

PILLOW BLOCK  
FOR  
18" x 36" Corliss Engine

THE JACKSON ENGINE CO

ROCHESTER, N.Y.

Scale 3" = 1 Foot August 3 1902

Drawn by \_\_\_\_\_  
Traced by \_\_\_\_\_  
Checked by \_\_\_\_\_  
Approved by \_\_\_\_\_

Nº 436 R

*Heating & Ventilating Arrangement*  
For  
**OHIO STATE UNIVERSITY**  
*Chemical Laboratory.*  
*Columbus, O.*

**B.F. STURTEVANT CO., BOSTON, MASS.**

Scale 1/4" = 1' July 3, 1902

15-7429-C.

CAST IRON FIVE STEP SPLIT CONE PULLEY S-7

FOR

**No. 80 STOP-CYLINDER PRESS**

**R. HOE & CO., New York**

*Half Size*

Drawing No. 258

Draftsman No. 15

2-1/2" Bolts S# 39

2-1/2" " S# 40

2-1/2" " S# 43

6-1/2" Nuts S# 10





ENTRANCE

TO - -

MAIN BUILDING

FOR -

GIRLS'

INDUSTRIAL

HOME

PROPOSED PLAN

FOR THE ENLARGEMENT OF

BARNES HIGH SCHOOL

JOHN QUINCY WILSON ARCHITECT

OCTOBER 7 1902

FIRST FLOOR

POWER PLANT

FOR

CENTRAL ELECTRIC RAILWAY

SCHENECTADY, N. Y.

JULY 8. 1902

SCALE  $\frac{1}{4}'' = 1'$ 

REMBRANDT GILMAN ARCHT

No 6

POST-OFFICE &amp; COVRT-HOUSE

SAN FRANCISCO CAL

WM MARTIN AIKEN SUPERVISING ARCHT

NOTE - SOFFIT OF BALCONY TO BE  
TERRA COTTA MOULDED AS  
SHOWN ON DETAIL SHEET 17.

- TERRA COTTA CORBEL -

DOTTED LINES SHOW CHASES IN BACK OF  
T.C. FOR FLASHING -

Note -

Floor of hood to be No. 1  
Cypress, surfaced and var-  
nished two coats of Spar  
varnish. All other lumber  
to be good quality well  
seasoned poplar, free  
from defects . . .



may frequently 'balance' the whole drawing, by taking advantage of the freedom allowed in selecting the styles and finish of the letters used in the title.

Sometimes the title is drawn on a separate piece of paper and then copied on the drawing. The advantage of doing this is, that before copying, alterations may be made until the title is seen to harmonize with the rest of the drawing. This scheme is especially useful in cases where elaborate titles are to be made and it is desirable to do as little erasing as possible on the drawing.

30. **Type Specimen**—In the central part of plate VII is given a portion of a title (reduced one-half) taken from one of a series of drawings (blue prints) of concrete structures, designed for the Illinois and Mississippi canal, which were made in the U. S. Engineer Office at Chicago. The remainder of the title consists of the words "Scale  $\frac{3}{8}$  in. = 1 ft.," together with a scale diagram, which for lack of space has been omitted in the plate. It happens that the number "10" comes at the middle of the first line, and is made larger to give a pleasing effect. But attention is called especially to this feature; the letters of any one line are all (with the exception noted above) of the same size, irrespective of the importance of the words. Thus in the last line of the title, the letters in the word "of" are made the same size as those in the words "upper portion" and "lock." This plan has been carried out throughout the titles and sub-titles of this series of drawings, with manifest advantage. The lettering, including the figures, (which is the finest the writer has seen) was first done with sets of type and a hand stamp, as described on page 10, on drawing paper, then the drawing and lettering together were traced on vellum from which the blue prints were made.

31. **CONCLUDING REMARKS ON LETTERING**—We have given in the preceding pages both mechanical methods, by means of which any person can learn to form letters and words, and illustrations and practical suggestions by means of which the student may improve himself in freehand lettering. Beginning with the study of the forms of the individual letters, the student, by studying spacing, sizing, disposition, and styles, progresses through mechanical methods, freehand lettering and title lettering, until he has mastered the whole subject of technical lettering. In the preceding pages it has been attempted to explain the principles and governing laws of the subject in so far as they are discoverable, so that any person by study and practice may master the subject. It should be born in mind, however, that the lettering, as well as the other features, of a drawing is intended primarily to suit the eye; that is, to convey the ideas, the drawing is meant to convey, to the mind through the medium of the eye, and to gain this end we find we may often depart from rule. For this reason it may happen that a person may sometimes observe every recognized law of the subject, and yet not excel in drafting, while a person who has never studied the subject may be a good draftsman, although he is likely to follow unconsciously the governing laws.

However, the writer believes that the skill for lettering technical drawings well, is an accomplishment which can be acquired by study, by observation, and

by practice : that beyond this we enter the realm of art where talent is required, but that as technical drawing makes up a large part of the work of the engineer, he should strive to perfect himself in this branch. Lettering, therefore, as a prominent feature of technical drawing, should receive its due share of attention. In closing, let us again urge the importance of practice. No one would think of learning to swim by simply *reading* how to do it, so, no one can learn to letter by simply perusing text. In no other business is the saying truer that 'work makes the workman.'

## Chapter IV.

# NORTH-POINTS, SCALES, AND BORDERS.

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32. The subject of north-points, scales, and borders, although not a part of lettering, will be treated here in connection with that subject, as it is usually so treated in such books as have touched upon the matter. In what follows, use has largely been made of a chapter on map drawing and lettering by F. S. Dennison in Hodgman and Bellows' "Manual of Land Surveying."

33. **North-points**—When the drawing is a map or plat of a survey, north-points or meridians are used to indicate direction. If no north-point appeared on such a drawing, the top would be taken to represent north, the right hand east, and so on. Regarding north-points, the following is taken from the article by Prof. Dennison:

"A true meridian is a necessary adjunct of all rightly constructed maps, as it is directionally their common line of comparison, and without it no just notion of the situation of the territory represented by the map, or of the bearing of its lines, can be obtained. It is, in fact, one of the co-ordinates to which reference is made for the solution of all problems of position on the drawing, and as such is entitled to consideration. This line should, therefore, be a somewhat conspicuous object, and the object of its existence demands that it should not be so obscured by ornament as to defeat its use as a sharp, clear line of reference for all north and south lines. Nevertheless, the draughtsman is warranted in giving to its construction more than a hasty or careless consideration. It is usual to ornament the northern end of this meridian with some neatly drawn and characteristic device, such as an arrow head, a fleur-de-lis, the head of a mediaeval lance, etc. At its southern extremity is sometimes placed the feather end of an arrow, or a crescent. Near the middle of the line may be drawn an east and west line, or four or eight pointed star, or radiating lines marking convenient points of graduation of the circle. It is well, also, to draw the magnetic meridian at the time of the survey, through the middle point of the true meridian, and mark the declination. This magnetic meridian should be even less ornamental than the true one, and when both are used it is generally agreed to draw a complete arrow head on the latter, while the magnetic line is subordinated by giving it only half a head, drawn on the right or left hand side, as the declination is east or west."

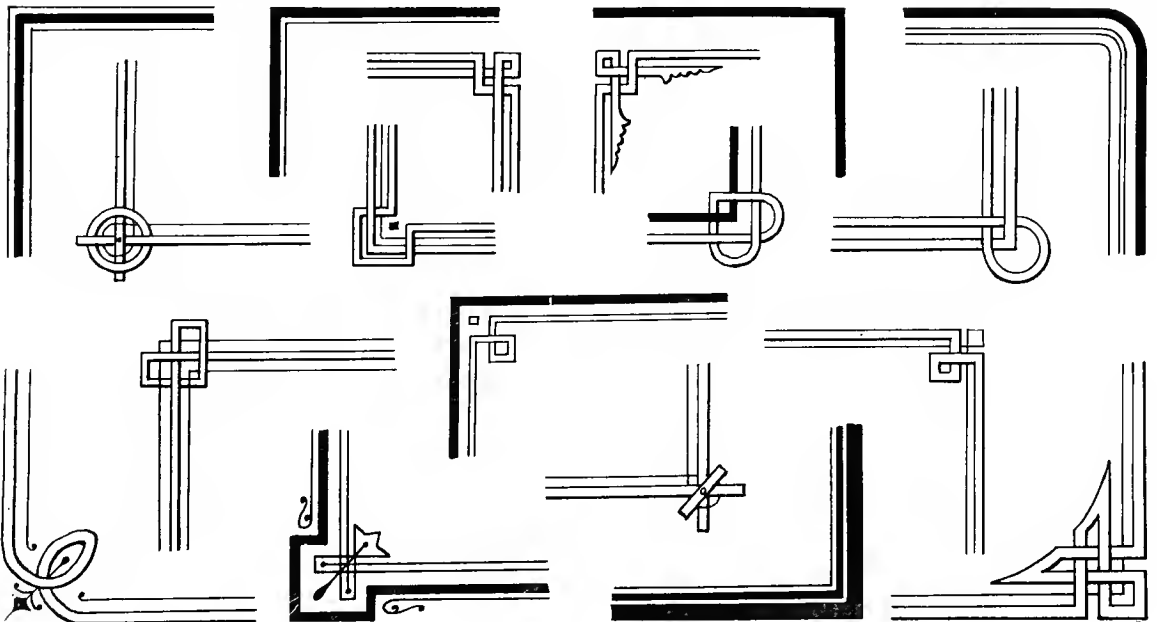
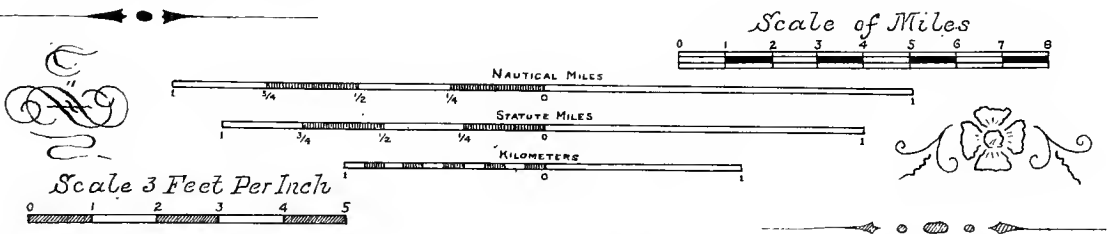
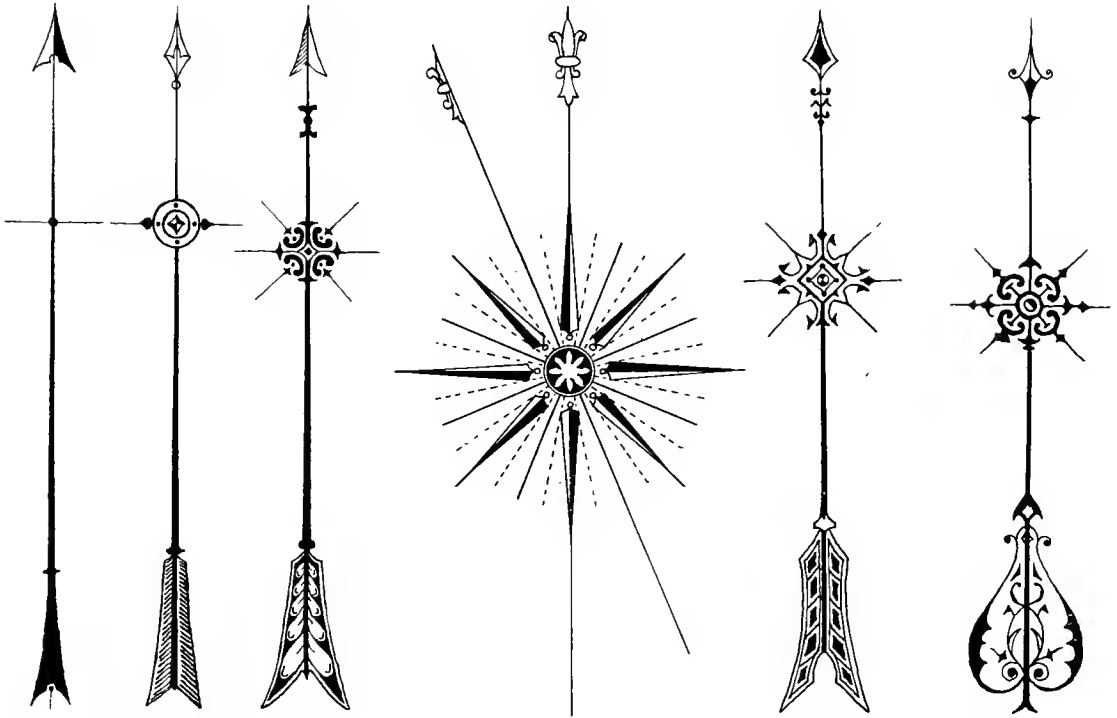
"The construction of a meridian affords considerable opportunity for the display of skill and taste in the draughtsman. It may easily be made an attractive, simple and elegant figure, reflecting the intelligence and spirit of an accomplished workman; or by its awkward design and slovenly execution, shake one's confidence in the mental capacity of one upon whom we should have

a right to rely. Perhaps it would not be inappropriate to say that the meridian line should be sufficiently long on most maps, to serve conveniently the purpose of transferring its direction to other parts of the drawing by means of a triangle and a straight-edge. The arrow head at the vertex should be a sharply pointed figure, entirely different from the obtuse, non-descript object which too often offends the eye in that position. And, to avoid all possibility of mistake, it is well to place the letter N some slight distance above or below the arrow point. When a star is used to give the various points of the compass, its radiating arms should be narrow and slender, with sharp points, avoiding all appearance or suggestion of dullness. In short, the entire figure should be constructed in the spirit of lightness and radiation, in harmony with its office, which is simply that of indicating *direction*."

In plate XI are given five designs for north-points which were taken from Esser's 'Alphabets,' and one (the central star) taken from Worthen's, *Topographical Drawing*. For ordinary use one of the first three will generally be found appropriate. However, if the drawing is more elaborate, one of the more elaborate ones may be selected to correspond, or the draftsman may design one to suit the case in hand. As already stated, a star is sometimes used. When the magnetic meridian is also indicated, as in the central star of the plate, the amount of variation from the true meridian should be stated in print between the two. The size and position of the north-point may vary considerably. Usually it is placed somewhere near the top of the drawing where the shape of the latter affords a convenient place, but sometimes when it consists of a simple design it is drawn directly upon the other features. This plan, however, should not be followed when a convenient place can be found for it. Its size will depend upon the size and scale of the drawing. Generally it will be slightly shorter than the length of the title.

34. **Scales**—The scale of the drawing should, of course, invariably be given. This is either done by indicating it in print, or by drawing for the purpose some such design as is seen in the center of plate XI, or by a combination of both, as in the design at the lower left hand corner of the central part of the plate. Where the drawing is not to be reproduced, as a plan or other drawing made for office use only, the scale may be indicated simply by lettering, as in the first title on plate VIII.; but where the drawing is to be reproduced by any one of the various processes of printing, as for example, a map to be engraved, it is better to indicate the scale by some such design as either of these shown in plate XI, as the reproduction may not be of the same size, and, therefore, not of the same scale as the original, and the design will then show the amount of reduction or enlargement. The scale is generally placed near the title, usually underneath it; if this rule is not followed, the scale is placed in some part of the drawing where it can readily be found.

35. **Borders**—Strictly speaking, the border is an unnecessary part of the drawing, as the utility of the latter would not be injured by the entire absence of a border. But, in at once limiting the eye to that portion of the paper which







has a distinct claim upon its notice, and in adding materially to the impression of completeness, accuracy, and neatness which one receives from such a drawing, the border is not without even some utilitarian value. As has been said of the north-point, the title, and the lettering in general, the border should agree in character with the rest of the drawing. In the lower part of plate XI a number of designs for borders are given. The simple heavy line, or a heavy line enclosing a lighter one, is a very good border for ordinary drawings. Two light lines enclosing a heavy one in the manner shown, is a border that has been much used by the United States engineers. Very elaborate drawings, or drawings made for display, may receive more ornamental borders; but even in such elaborate drawings it should be remembered that freehand decorations representing garlands, vines, tassels, etc., are generally in bad taste. The simple borders used on the fine maps of the United States Coast Survey show that plain borders are often not inconsistent with elaborate drawings, and that the beginner is therefore in more danger of overdoing than underdoing the matter of borders.

The border on a technical drawing usually encloses a rectangular area, and should be made to enclose as small an area as is possible without appearing to cramp the drawing. To gain this end it is sometimes convenient to break the border and allow projecting parts of an irregular figure to protrude. When parts so protrude, they should not extend farther than half way between the border and the edge of the paper, if it is desired to attain neatness in the drawing.

Regarding the width, "a rule commonly followed is to make the total width of the border about the one-hundredth part of the shortest edge of the drawing, supposing the latter to be rectangular in shape. If two lines, a heavy and a light one, are used for a border, the white space between the heavy and light line is usually made about the width of the heavy line."

The distance between the border and the edge of the paper is also a matter for consideration. The usual width of this margin around the border is an inch and a quarter or an inch and a half, on drawings of less dimensions than, say, two and a half feet by three feet. The width of this margin, however, depends upon circumstances, such as the scale and shape of the plot; for example, of two drawings made on the same sized sheets, the one drawn to the larger scale may consistently have a wider margin. It is best to allow at least an inch and a quarter on all drawings, we may safely say. Of course if collections of drawings are to be bound, the above rules may be modified to suit the circumstances.

**36. REFERENCES**—The following works were consulted in first writing this book :

Appleton's *Cyclopedia of Technical Drawings*, pages 65 to 70, and pages 174 to 181. There are some good suggestions on spacing in this book which have been quoted in the article on the spacing of letters in the present treatise at page 11.

A Practical Treatise on Topographical Drawing, extracted and slightly modified from Appleton's Cyclopedia and edited by Wm. E. Worthen. This work is comprised in Appleton's, but has a few suggestions in addition.

Ames' Alphabets is a collection of 35 plates of letters and figures "adapted to the use of architects, engravers, engineers, artists, sign painters, draftsmen, etc." This work contains several plates of letters suited to engineers, but the majority of the plates are too ornamental for technical drawings.

Plain and Ornamental Standard Alphabets, by Frederick Copley, is a collection of 46 plates of "alphabets of all the various hands in modern use, with examples in each style, designed as a text book." Most of these alphabets are too elaborate for technical use, but there are a number which are appropriate for titles.

Freehand Lettering for Working Drawings, by Prof. C. B. Wing, of Leland Stanford, Jr. University, is a little pamphlet of alphabets, only three or four of which, in the writer's opinion, are to be recommended for ordinary use. There is a pithy preface to this pamphlet, which has been quoted from on page 35 of this book.

Industrial Science Drawing, Part II, by S. Edward Warren, contains in article 246, page 146, a few suggestions on lettering, including title lettering.

Draughtsman's Alphabets, "a series of plain and ornamental alphabets," by Herman Esser, is a collection of 31 plates of letters for draftsmen, sign painters, architects, etc. From this work have been taken five of the designs for north-points, given in plate XI. For the rest of this book, the remarks made about Ames' alphabets will apply.

Students Alphabets is a pamphlet of eight plates taken from Esser's book of alphabets and slightly modified, published by Keuffel & Esser, New York and Chicago.

Topographical Drawing and Sketching, by Lieut. H. A. Reed, from pages 63 to 69, contains some valuable ideas on lettering topographical maps. These suggestions are applicable to general maps and have been quoted in part in the article on Disposition of the Letters, page 13 of the present work.

The Draughtsman's Handbook of Plan and Map Drawing, by G. G. Andre, contains some useful matter on lettering, together with three or four plates of letters. The book is English, and hardly represents American practice at the present time.

A Manual of Topographical Drawing, by Lieut. R. S. Smith, contains some suggestions on lettering in articles 78 and 79, and 80 and 81, pages 40 to 45.

In a Manual of Land Surveying, by Hodgman & Bellows, is a chapter on map drawing and lettering, by C. S. Dennison, which is well worth reading by every draftsman. This chapter, as already mentioned, has been drawn upon largely in the article upon north-points, scales, and borders.

In the Manual of Topography, by J. Enthoffer, the æsthetics and construction of letters are elaborately discussed on pages 23 to 33, and three plates of letters are given to illustrate the text.

The Book of Ornamental Alphabets, Modern and Mediaeval, by F. Delamotte, is a collection of 54 plates of alphabets, initial letters, etc., all of which are too elaborate for use on technical drawings.

A System of Easy Lettering, by J. H. Cromwell, is a paper-bound collection of twenty-six plates of alphabets. In this work is shown a method of lettering in which "we have but to divide any surface we may wish to letter into squares (or parallelograms, as the case may be), in pencil lines ; form the required letters, in ink or paint, according to the style chosen ; erase the pencil lines, and the lettering is complete." This method, however, results in letters too stiff and awkward in appearance to be used very much.

In the Theory and Practice of Surveying, by Prof. J. B. Johnson, the short article on map lettering, is pithy and to the point.

Mechanical Drawing, by C. W. MacCord, is "progressive exercises" for mechanical engineers, in its first part, but contains on page 52 a plate of good borders for drawings of machines, etc. Some of these borders have been selected or modified for plate XI of the present work.

In writing the present treatise the attempt has been made to include all there is on lettering in the above mentioned books that is of practical value to the engineer.



















